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The A.R.E.A. Program

The convention will be called to order promptly at 9 o'clock this morning. The afternoon session is scheduled to convene at 2 o'clock. The program is as follows:

TODAY

Iron and Steel Structures
Wooden Bridges and Trestles
Masonry
Records and Accounts
Buildings
Address by O. H. Caldwell, Esq.
Member, Federal Radio Commission
Rail
Economics of Railway Location
Economics of Railway Operation
Economics of Railway Labor
New Business
Installation of Officers
Adjournment

The A.R.E.A. Membership

THE widespread interest in the work of the A. R. E. A. is shown nowhere more effectively than in the classification of the membership, presented by Secretary Fritch in his report Tuesday morning. In addition to the 1846 officers of railway engineering departments, there are included in the membership 112 general superintendents, division superintendents and other officers of the transportation department, 17 officers of the mechanical department, 25 purchasing traffic and accounting officers, etc. Of particular note is the fact that there are 203 higher executive officers, including 58 presidents and 73 vice-presidents. Nor is the membership of these latter men perfunctory, for the association includes five railway presidents among its past presidents and another is the nominee for vice-president this year. A membership such as this not only reflects the high standing of the organization, but it also provides an agency for the harmonizing of the ideas of various groups on fundamental problems of engineering and transportation.

Wooden Overhead Bridges

THE report of the Committee on Wooden Bridges and Trestles covering overhead wooden bridges leaves no doubt in the mind of the reader as to the attitude of the committee concerning the utility of wood for a particular purpose. Indeed, it would be surprising if there are not advocates of other materials of construction who would characterize the report as a brief for the use of wood. However, there seems to be little if anything in the committee's statement which will not bear the test of careful analysis. The suggestion that spraying machines be employed as a means of providing preservative treatment after the original preservative has disappeared or lost its toxicity, is an interesting one, but is necessarily academic until it has been subjected to exacting experimentation. One point which might have been added to the report by way of strengthening the position taken is that wood is essentially immune from one agency of deterioration which has proved exceptionally destructive to steel, and to a somewhat less extent on reinforced concrete, when used in structures over railway tracks—namely, the corrosive action induced by locomotive gases.

Confusion in Titles

AMONG the subjects assigned to the Committee on Rules and Organization, a year ago, was a study of the titles of maintenance of way officers, with a view to the adoption of certain terms as standards of recommended usage. This subject, as covered in the report which the committee will present today, is confined to a list of titles, with explanations of the duties and resposibilities which each title implies, and is recommended for adoption. This list is clearly based on com-

mon sense and conforms to current usage on the part of the railroads. However, it might have been well for the committee to have directed attention to the need for proposing such standards, namely, the utter lack of standardization which now prevails. For example, speakers at conventions of the Roadmasters and Maintenance of Way Association feel impelled to refer to both roadmaster and supervisor, because the terms are used interchangeably. Even greater confusion occurs at the bridge and building conventions, which are attended by men with the titles of master carpenter, chief carpenter, bridge and building supervisor, bridge and building master, and variations of these terms, nearly all of whom have substantially the same duties. Unless emphasis is placed on the advantages of the adoption of a uniform nomenclature, the acceptance of this list of titles may prove of no particular benefit.

Chairman Parker's Address

IT is doubtful if most railway officers who have carefully studied the subject believe quite as strongly in the benefits to be derived from consolidations as does Chairman Parker of the House Committee on Interstate and Foreign Commerce, who spoke at the dinner of the American Railway Engineering Association last night. Nevertheless, most railway officers believe many consolidations are desirable, and concur in most of the views expressed by Mr. Parker in his able and constructive address as to the kind of legislation that is needed to make it practicable to carry out a policy of consolidations in a way that will be fair and advantageous to both the public and the railways.

When Congress adopted the consolidation provisions of the Transportation Act in 1920 it made two serious mistakes. One of these was that of providing that when two or more railway properties were merged the securities issued by the controlling company should not exceed the aggregate valuation of the properties combined. This is an obstacle to consolidations because, presumably, the valuations to be considered are those being made by the Interstate Commerce Commission, and it may be a long time before any of its valuations will be made actually final by decisions of the courts. The second mistake made by Congress was in providing that the Interstate Commerce Commission should make a general plan to which all consolidations must conform. After having for nine years taken the position that the formulation of any general plan is impracticable, the Commission is now renewing its efforts to formulate one. To do so is as impracticable now, however, as it has been heretofore.

Legislation authorizing voluntary consolidations by the railways, but subjecting them to approval or rejection by the Commission according to its view as to whether they will be in the public interest, is now generally conceded by financiers, railway officers and economists and, apparently, by most members of the Commission, to be desirable. This being unquestionably the consensus of informed opinion, it seems remarkable that it has thus far been impossible to get such legislation passed by Congress. Mr. Parker evidently believes, however, that it will be passed when Congress again has opportunity to give consideration to it.

Mr. Parker emphasized the need of consolidations as a means of solving the problem of rate regulation presented by the existence in each territory of railways of very unequal earning capacities. The important fact should not be overlooked, however, that the average return being earned by the railways as a whole and by each large territorial group is less than a fair return upon the Commission's tentative valuation. If, therefore, consolidations should be formed, by uniting strong and weak roads, which would make the earning capacities of the new systems practically equal, it would still remain true that the railways as a whole, and those of each large territorial group, would earn on the average less than a fair return unless a more liberal policy of regulation of rates were adopted. Many persons apparently believe that consolidations would result in large economies which would increase the net return earned and thereby make it adequate. They undoubtedly have an exaggerated idea of the economies that would result. Furthermore, the railways within recent years actually have effected very large economies in operation, and these have failed to result in increases of net operating income sufficient to make it equal to a fair return upon any basis of valuation which has been favored by anybody excepting extreme radicals.

The railroad problem of the country can never be considered solved until the railways are so regulated as to allow them, over periods of years, to earn the fair annual return to which the courts and Congress in adopting the Transportation Act have conceded they are entitled and which the economic welfare of the country requires they shall be allowed to earn. However desirable new consolidation legislation may be, its adoption alone will fall short of solving the problem of regulation of railway rates.

A Valuable Service

AT the conclusion of this convention there will drop from the Board of Directors of the A. R. E. A. a member who has served the association for three years with such diligence as to warrant special mention. We refer to R. H. Ford. Naturally a close student and a hard worker, he has applied himself to the problems of the board with unusual energy.

Particularly in his capacity as chairman of the board's committee on assignment of work, has he rendered especially valuable service. Here he has watched the progress of the committees closely, noting those assignments which warranted continuation into another year. In the meetings he has taken voluminous notes of the discussion in order to record the reception accorded various reports by the members. He has also made frequent inquiry of members at large. As a result, the assignment of committee work has been planned on a more systematic basis than ever before. Of equal importance, the work has been greatly expedited.

When Mr. Ford took over the chairmanship of this committee, the assignments were completed and announced in April. Last year they were made public shortly before the convention. This year they were in printed form and distributed to the members by January 10, as a result of which many of the committees for the next year have already perfected their organization and started on their work. That the completion of the program of the year's activities is no simple task is shown by the fact that 184 different subjects have been assigned for study next year. By this measure, the work of the committees has been advanced three months.

It is not our intention to ignore the part that the committee on Personnel of Committees and particularly Secretary Fritch and his staff have taken in the accomplishing of this result, for the giving of credit to these men does not detract in any way from that due Mr. Ford.

As to Grade Separation at Street Intersections

A DEFINITE, progressive program for the protection or elimination of highway grade crossings on any logical basis would be a boon, but the present multiplicity of public authorities and the influences behind them tend to prevent the consummation of any logical program. The result is that money is spent in zones of intense pressure of officialdom where the necessity for relief sometimes does not exist or is much less than at other places where such pressure is not applied.

A statewide authority over the selection of sites for crossing improvements should include the authority to vacate, combine and detour traffic routes. City streets and other highways were laid out for horse-drawn traffic which traveled at a fourth the speed of the automobile. Therefore, except in cases where the volume of traffic has increased, there is now no need for more than one-fourth of the railroad crossings of city streets. It is generally conceded by fair investigators that, for automotive traffic, one-fourth mile is the proper minimum interval between railroad crossings in a city. Such a distance is of advantage also to industries alongside tracks, affording space for industrial sidings.

The burden of grade separation placed on the railroads today is needlessly onerous because of the haphazard loading, due to local influences. Witness a city program of the past three years covering improvements to street crossings of a single-track switching lead two miles long where the railroad traffic consists only of freight movements actuated by a single switch engine working from noon to 3 p. m. daily. This switching track is crossed by 23 city streets extending through a second-class residence district interspersed along the railway with a few coal yards and an occasional small factory. Although the 23 parallel streets are less than 400 ft. apart, local authorities have successfully resisted the closing of any crossing. Eight streets cross under the railroad while 15 cross at grade. Four subway bridges have been rebuilt and lengthened during the last three years because of street widenings in the least congested part of the district, while flashlight signals have been demanded at all the grade crossings and railroad land is now in process of condemnation for the purpose of opening two new grade crossings over this track. Where aldermanic influence is not so insistent in other parts of this same city of several hundred thousand inhabitants, there exist many grade crossings of several important high-speed tracks without protection of any kind.

What is really most needed in this community is attention to vehicular traffic at street intersections near the civic center, where street widenings and separation of grades between streets would provide relief from fatalities and congestion far in excess of that experienced at railroad crossings. This is no isolated case. In large and even small cities, we have reached the saturation point of traffic at many main thoroughfare intersections. Major highway intersections in suburban localities provide similar examples which might well be surveyed. Even now there are innumerable cases where the separation of the grades at street intersections would be of infinitely greater public benefit than separations at neighboring railroad grade crossings.

It is of course unthinkable that the division of costs has any influence in favor of separating grades at rail crossings rather than at highway intersections, where the greatest good to the greatest number undeniably results from the betterment of highway transport. Rather let us assume that the public authorities have not as yet visualized this greater public benefit because of the absence of "a program of elimination founded on the economic saving to highway traffic."

We sincerely hope that separations at street and highway intersections may not be long deferred, for automotive traffic has so rapidly increased that before we have had time to tackle properly the problem of the railroad grade crossings, public necessity and convenience have shifted distinctly to the highway intersection. The improvement of main thoroughfares and the elimination of less important streets will go far toward the solution so important to the mutual interests of the public and the railroads.

As Parts of a Finished Whole

PERHAPS never before in the history of railroading have the various departments, and the associations composed of members of these various departments, worked in as close harmony as they are doing at the present time. The day has passed when one department insisted on the adoption of certain policies or standards, with the attitude—implied if not spoken—that if the other departments didn't like it they could take a long running jump. Instead, it is now realized, with only minor exceptions, that the efforts of each department should be to furnish a transportation machine that will emulate the results achieved in the manufacturing field by mass production, whereby the product pursues an even flow during its evolution into the finished article.

In order to arrive at this desired goal, it is necessary that each department understand the broad problems confronting all other departments in attempting such a solution, for usually the engineering and maintenance, the motive power, the operating and the traffic departments have some limitations which must be observed. If one department only were allowed to dictate, the problem would be simplified for all concerned except the shippers who pay the bills and the bondholders and stockholders who have an archaic feeling that money invested in railways is entitled to some return, not to mention the management which might attempt to satisfy the shippers and investors under such conditions.

In the report of the Committee on Electricity will be found a statement which might well be adopted as a tenet in the principles governing the work of committees dealing with different, yet related, subjects, or of different departments in a railway organization. This committee, collaborating with the Committee on Economics of Railway Location on the subject of electric locomotives, expressed its views in the following significant statement:

"The Committee on Economics of Railway Location has prepared an excellent report on the design of locomotives, with particular reference to the major considerations affecting such design. It probably is not within the province of any of the working committees of the American Railway Engineering Association to prepare designs of locomotives but it seems that it would be proper for the committee to make suggestions with reference to the consideration governing such designs.

"It is recommended that after a discussion of this portion of the report of the Committee on Economics of Railway Location, the data be referred to the Joint Committee on Electric Traction."

CONVENTIONALITIES

A visitor yesterday was Thomas Vein, deputy chief commissioner of the Board of Railway Commissioners of Canada, who is also serving his eighth year in the Canadian House of Commons.

A new idea introduced this year by President Faucette, in the form of one issue of the bulletin devoted to messages from the past presidents of the association, has met with much favorable comment. The papers prepared by these gentlemen were all pithy and interesting and well worth anybody's time to read.

A survey of the members passing the registration desk indicates that engineers are extremely partial to pipes. Of 112 who passed the desk in the space of about ten minutes yesterday, 54 were smoking pipes, 26 preferred cigars, only 18 were smoking cigarettes, while 14 were not smoking at all.

The A. R. E. A. lost two valuable representatives on the Joint Committee on Culvert Pipe during the last year—A. F. Robinson, bridge engineer of the Atchison, Topeka & Santa Fe System, and Job Tuthill, assistant chief engineer of the Pere Marquette. Both of them were members of this committee from the time of its inception several years ago and their knowledge and experience were of pronounced value in this important work. Mr. Robinson had also served for many years on the Committee on Iron and Steel Structures, while Mr. Tuthill was an active member of the Committee on Masonry, being vice-chairman at the time of his death.

A Central Point

The state secrets of the committees are sometimes interesting. Take one committee we know of, for instance. This committee was meeting in solemn conclave and the subject under discussion was the time and place for the next meeting. In order to save the membership from useless traveling, the chairman produced a map of North America. After some discussion, it was concluded that the geographical center for the committee was some point in Ohio. This fact was verified by one of the members, who produced a slide rule. After scaling off distances from a parallel of latitude and a meridian of longitude, he computed moments and determined that Marion, Ohio, was the exact geographical center. This fact arrived at, the following procedure took place:

Chairman: It seems to me that this fact should be taken into consideration in arranging our meeting place.

Member: I move we hold the meeting in Montreal.

Five members in unison: Second the motion.

The motion was duly carried.

About 60 signal men attended a luncheon Tuesday at the Stevens. To gain admission one had to have suitable credentials to show that he was a Pennsy or an Ex-Pennsy man. Rudd, the instigator, got the bunch together.

The older members of the A. R. E. A. have been much gratified to note the presence at the convention of George W. Kittredge, retired chief engineer of the New York Central. Mr. Kittredge is senior living past president of the association, having directed its activities in 1901-2.

Charles A. Morse, retired chief engineer of the Rock Island System, appeared at the convention yesterday with a healthy sunburn which he acquired in Southern California. After reaching the age of 70 and retiring on January 1, Mr. Morse, with his wife, went to California for a well-earned vacation. He came back for the convention specifically to "see the boys" and to renew acquaintances. He is looking forward with special pleasure to the privilege of attending the fiftieth reunion of his engineering class from the University of Maine at Orono, Me., next June. After spending the summer at his camp in Northern Maine, he will return to Chicago to make his home here.

How Busy Railway Supply Men Spend Their Time

The accompanying photograph shows George Nichol, vice-president of the Johns-Manville Company, Inc., and Eddie Condit, vice-president of the Rail Joint Company, hard at work with Carroll Harding, consulting engineer, Southern Pacific Company, at a San Francisco country club. This photograph confirms the oft-repeated note regarding the hard life of the railway supply man.

Carrol Harding, Eddie Condit and George Nichol at Work

C. Marshall Taylor, formerly superintendent of timber preservation of the Reading-Central of New Jersey and past-chairman of the Committee on Wood Preservation, appears at the Coliseum this year for the first time as a supply man. Mr. Taylor is vice-president and general manager of the Curtin-Howe Corporation, New York.

The Purchases and Stores division, A. R. A., is taking advantage of the attendance of a number of its members at the American Railway Engineering Association and the appliance show by holding several committee meetings in Chicago this week as follows: The Committee on Stationery and Printing met on Tuesday, the Committee on Forest Products met on Wednesday, the Joint Committee on Reclamation is scheduled to meet on Thursday and the committees on Training and Selection of Employees and on Fire Prevention are scheduled to meet on Friday.

Tribute to President Faucette

A feature of the annual dinner of the A. R. E. A. in the grand ballroom of the Palmer House on Wednesday evening, which was not announced in advance, was the presentation of a silver cup to President Faucette by a number of his friends and brother members on behalf of the association. The cup bears the inscription:

"Presented to W. D. Faucette, President, American Railway Engineering Association. Thirtieth Annual Meeting, March, 1929."

The cup is similar to the one presented to Past President Brumley last year and is a fitting tribute to Mr. Faucette for his constructive work during his long membership in the association.

Cup Presented to President Faucette

A. K. Shurtleff Retires

A. K. Shurtleff, who has served as assistant secretary in the office of Secretary Fritch for several years, was retired on pension at a recent meeting of the board of directors, having reached the age of 70. Mr. Shurtleff is a veteran of the association, having become a member as early as 1904 while with the Union Pacific. He has also taken an active part in the association work, serving as chairman of the Water Service Committee in 1906 and as chairman of the Committee on the Economics of Railway Location in 1913. He was co-author with the late J. B. Berry of a masterly treatise on location and grade revision, a subject in which Mr. Shurtleff has long been considered an authority.

Word has just been received from C. H. Loutrel, president of the National Lock Washer Company, of the promotion of G. La Rue Masters to the newly created position of sales manager and the addition of Waldo E. Bugbee to the sales engineering force. It has been suggested, in view of the fact that the total lock washer sales of this company total some forty million pieces annually, that Professor Einstein or some equally famous mathematician be added to the staff to keep track of the sales.

Samuel T. Wagner, consulting engineer for the Reading and former chief engineer of that line, managed to spare enough time from his philanthropic activities to be present at the convention as usual. Mr. Wagner's great-uncle founded the Wagner Free Institute of Science in Philadelphia in 1848, and Mr. Wagner has always taken a deep interest in the institute, which enables poor but ambitious youths to obtain a scientific training. He conducted courses there for a number of years, and, since his retirement from the active duties of chief engineer, he has devoted much more time to the institute.

Using the Convention

The Illinois Central believes in taking full advantage of the opportunities afforded by the convention. Coincident with the meeting dates, all the division supervisors of water service and all the division storekeepers hold meetings in Chicago, thus enabling these men to get the benefits of the exhibits at the Coliseum.

Tunnels and Weather

The following item, copied from Carlton Fitchett's column in the Seattle Post-Intelligencer, purports to account for the exceptionally cold weather Seattle has experienced following the opening of the Great Northern's new Cascade tunnel:

Listen, my children, and you shall hear what makes our weather at present so queer. Just three weeks ago, or maybe 'twas four, they opened to traffic the Great Northern bore. The very next day, as perhaps you recall, the doggone thermometer started to fall!

The wind from the East, it started to blow, and first we had frost and next we had snow. It snowed and it froze and the mornings were raw. We're waiting and hoping, but still there's no thaw. There must be a reason behind it, no doubt, and so, while I shivered, I figured it out.

That hole through the mountains is causing a draft, like breezes that sweep through a dumb-waiter shaft. The winds from Montana they sweep through the bore, and so we are frozen as never before. Our coal piles are shrinking, our faucets won't run; and all are complaining, yet nothing is done!

Of course the new tunnel, it fills a great need. It cuts down the mileage, increases the speed. But may we suggest as a well-meaning friend they hang up a storm door, at least on this end? And may we suggest to the railroading crew, they close it behind them when they have passed through.

And early next summer, when heavens are fair, we'll ask that the storm door be taken from there. And thus in the Inland, where folks often roast, they'll all be refreshed by a breeze from the coast.

Messrs. Blaess and Brumley of the Illinois Central are practically forced to attend the convention this year, whether they want to or not. When both returned from trips at the end of last week, they found that the cleaners and painters had taken possession of their offices and the only place they could work was out in the hall, so they decided to be present at the Palmer House.

This business of being president of things is contagious. At least, D. J. Brumley, of the Illinois Central, shows its effects. Not only was he president of the A. R. E. A. last year, but once in the habit, he continued it by being elected president of the new state bank at Flossmoor, Ill., his home town. He is now the nominee of the Western Society of Engineers, Chicago, for first vice-president and served the Chicago Engineers Club as president in 1926-27.

U. of P. Alumni Luncheon

Twelve alumni of the University of Pennsylvania who are attending the convention, met at a get-together luncheon yesterday at the Palmer House. The following men attended: S. T. Wagner, '81, consulting engineer, Reading; J. C. Irwin, '90, valuation engineer, Boston & Albany; T. L. Doyle, '03, division engineer, Pennsylvania; P. G. Lang, Jr., '05, engineer of bridges, Baltimore & Ohio; G. H. Stewart, '05, supervisor of track, Pennsylvania; W. E. Baker, '09, supervisor, Pennsylvania; A. H. Woerner, '09, division engineer, Baltimore & Ohio; F. X. Kern, '10, Headley Good Roads Company; W. W. Philler, '10, Bethlehem Steel Company; H. W. Anderson, '11, Pennsylvania; J. N. Grim, '14, division engineer, New York Central; A. C. Jack, '15, Carnegie Steel Company.

Big-Time Talent

Few of those who attended the dinner of the Signal Appliance Association at the Stevens Hotel on Monday night dreamed that there was so much latent talent among the members of the railway and supply associations. The program of entertainment was presented, in the main, by members of the two organizations. It included: (1) Art Smith of the Railroad Supply Company and Harry Folk of the Electric Storage Battery Company who presented a highly entertaining skit entitled, "Just Nonsense from the East," with Art appearing as a blackface comedian and pianist and Harry as an imitator of Al Jolson and Eddie Cantor; (2) The Red Arrow Quartet of Pennsylvania employees, including a conductor, a freight brakeman, a signal maintainer and a signalman, who presented several musical numbers comparable with those which they have given in more than 800 programs on the air over 40 different radio broadcasting stations; (3) "Two Indians from the Pacific Coast," a musical number, presented by Harry Renick of the Magnetic Signal Company and Bert White of the Los Angeles & Salt Lake. Fred Bender, signal engineer of the Central of New Jersey was song leader, L. W. McChesney of the Thomas A. Edison, Inc., was master of ceremonies, Al Leonard of the Handlan Buck Manufacturing Company and Gerry Swallow of the Diamond State Fibre Company were stage directors. Few stage productions have been more favorably received than those in this program.

The management of the Chicago & North Western evidently believes in keeping up with the news for it will move its general offices into the new Chicago Daily News Building on May. 1.

Word reached Chicago late last week that W. D. Hudson, a member of the A. R. E. A., died suddenly on February 25. He underwent an operation about two weeks ago, following which pneumonia set in and was the direct cause of his death. Mr. Hudson was a member of the organization of Harland Bartholomew and Associates, city planning experts, St. Louis, Mo.

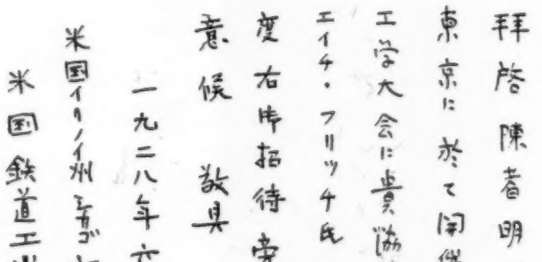
That fame is no respecter of international boundaries is shown by the fact that C. R. Knowles, chairman of the Water Service Committee, and superintendent of water service of the Illinois Central, has been invited to address the American Association of Railroad Superintendents at the annual convention in Mexico City in June on operating aspects of railway water supply. To insure that Mr. Knowles would look kindly on this invitation it was addressed to President L. A. Downs, who passed it along with other routine assignments.

"He Say No!"

The accompanying illustration can, doubtless, be read with ease by most of the members. For those few who are acquainted with the language of the Flowery Kingdom, we translate below:

"I hope you will kindly send Mr. E. H. Fritch to my country as a delegate of your association to the World Engineering Congress to be held in Tokio in the fall. Regards."

All of which reminds us of the Japanese who was


拝啓陳者明一九二九年秋
東京に於て開催せらるべき世界
工学大会に貴協会を代表しイ！
エイチ・フリッチ氏を特差遣相成
度右御招待旁々此段得貴
意候　敬具
黒河内四郎
一九二八年六月一日
米国イリノイ州シカゴ市南ラボン街四三一
米国鉄道工学協会　御中

Notice the Mis-Spelling in the Third Paragraph

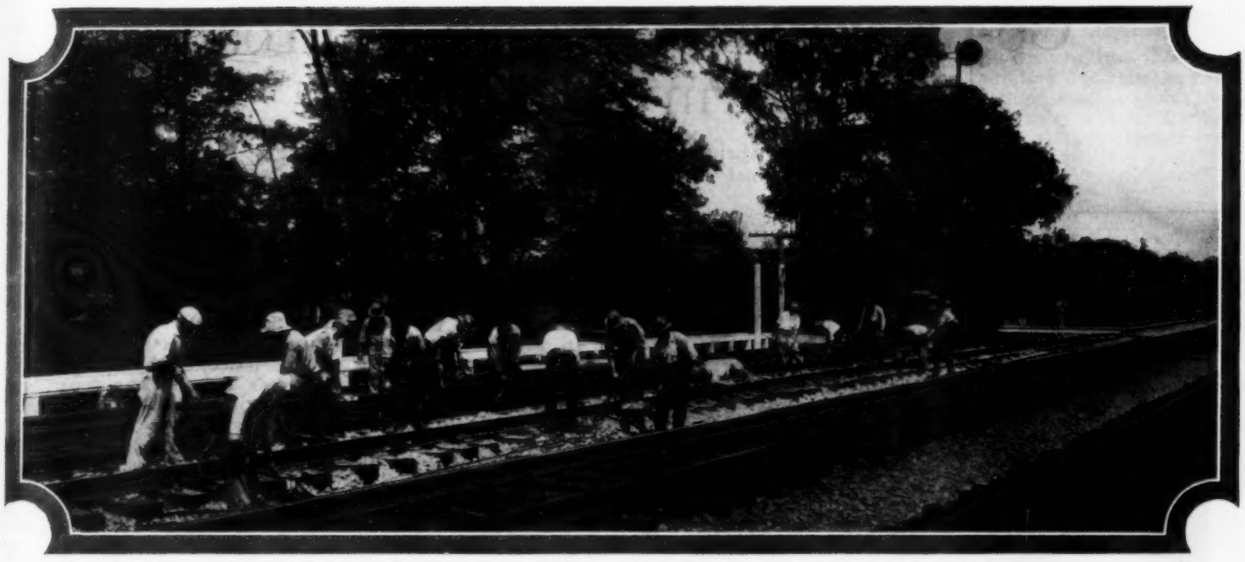
a murder witness, but spoke no English. An interpreter was procured, and the judge asked:

"Did this man see the crime?"

The interpreter repeated the question and the witness launched forth into an impassioned flow of Japanese, with violent gestures, that lasted fully ten minutes. Finally, the oration ceased and the judge asked the interpreter:

"What did he say?"

"He say 'No'," was the astounding reply.



Tie Tamping Gang on the New York Central North of Dumont, N. J.

A. R. E. A. Completes Second Day of Successful Convention

Association holds busy sessions. Reports of nine committees were received and discussed

THE outstanding feature of the second day's sessions of the American Railway Engineering Association's convention at the Palmer House was the address of Major General Edgar Jadwin, chief of engineers of the United States Army. This was owing not only to the standing of the speaker, but as well to the fact that his address, and the introductory remarks of President Faucette were broadcasted from Radio Station WJJD. The attendance during General Jadwin's address was larger than for any other feature of the convention up to that time, every seat being filled and at least 200 persons were standing, bringing the total attendance to about one thousand.

The first committee to be called to the rostrum was that on Rules and Organization. Upon dismissing this committee, and before calling the next committee, the President requested Secretary Fritch to read a letter from R. H. Aishton, president of the American Railway Association, which is reproduced below.

President Aishton's letter:

"Dear Mr. Faucette: It is a matter of most sincere regret to me, at the last moment, that I find I will be unable to get to Chicago next week to attend the Annual Convention and dinner at the American Railway Engineering Association.

"One reason for wanting to be there is that I feel that a word of appreciation is due you and your associates for the very splendid work that has been accomplished by the Engineering Division, No. IV, under your able and energetic leadership in the past year; also for the very excellent work of the active committees dealing with various subjects, and particularly to indicate to you all the helpfulness of the spirit of co-operation that you have evidenced, not only with the activities of the American Railway Association but particularly with the representatives of public interests. In this manner you have helped bring about better understandings, helpful and beneficial alike to the railroads and the public. Your accomplishments in this direction constitute a record in which you may well take pride.

"I am sorry that I cannot be with you to express this thought to your membership personally at the meeting.

"With my assurance that it is a pleasure to be of help to the association and to the Engineering division at any time, and with my kind personal regards and best wishes to you all, I am, sincerely yours,

"R. H. Aishton."

Reports Actively Discussed

The committees on Yards and Terminals, Rivers and Harbors, Wood Preservation, Stresses in Track and Grade Crossings were heard in regular order at the morning session, the discussion of the report on Grade Crossings being discontinued as the time arrived for General Jadwin's appearance, to be resumed in the afternoon. The report of this committee was actively discussed as was that of the Committee on Track which followed. Somewhat less time was accorded to the report on Electricity and that on Signals and Interlocking, which was presented at the close of the session. The Committee on Electricity paused in the presentation of its report to pay tribute to the late Edwin B. Katte, for many years its chairman, who died during the last year.

Just before the presentation of the Track committee's report, the results of the election of officers were announced and received with applause. They are reported in detail on another page.

Co-Operation Between Railroad and Army Engineers

By Major-General Edgar Jadwin
Chief of Engineers, U. S. Army

Major-General Edgar Jadwin
Chief of Engineers, U. S. Army

ARMY engineers and railroad engineers have aims and ideas in common. We have many contacts in peace and in war. Before the World War, no engineer railroad troops were in existence in this country, although study had been made of the ways and means of meeting the railway transportation needs in various possible theatres of operation. Immediately following our entry into the World War, the then chief of engineers, General Black, began raising nine engineer railway regiments, the supervision of which he placed largely in the hands of S. M. Felton, now chairman of the board of the Chicago Great Western, and president of the National Society of American Military Engineers. Assisted by railway executives, we secured experienced construction and maintenance engineers, operating officials and other railroad personnel, and commissioned them in the engineer officers reserve corps.

Our plans for national defense in the event of another emergency must include many railroad units. Our plans for a major emergency in case the existence of our country is threatened by invasion contemplate the organization of 36 railway battalions in the organized reserve. It is the policy of the war department to allocate these units to commercial railway systems. Commercial railways are co-operating with the war department in its plans for national defense. There are now approximately 400 railway officers of the engineer reserve corps assigned to railway battalions. Each battalion consists of one company for maintenance of way, one for maintenance of equipment, one for operation, and a headquarters and service company. The battalion commander acts as division superintendent.

The battalion is organized to maintain and operate a railway division of about 50 miles in length. The battalion commander is commissioned upon the recommendation of the appropriate railroad official. Subordinate officers of the battalion are assigned and promoted upon the recommendation of the battalion commander. The primary qualification of an officer assigned to a railway battalion is his professional fitness to perform the duties of his grade and position. As all of the personnel are performing practically the same tasks that they would be called on to perform in time of war, no technical training is needed and little purely military training is required. The military training necessary to make the unit capable of functioning in a military machine can be given in a short period of time. The organized reserves cannot be called for war service except in a major emergency declared by Congress.

In case of war in a hostile country, most of the railroad construction, maintenance and operation must necessarily be performed by military personnel. It will, however, be the general policy of the department to push the zone of operation by civilian railways as far forward in a friendly country or even in a hostile country as may be possible. The plan must necessarily vary according to the situation. Civilian personnel should never be so far forward as to be in danger from coming under fire.

In case of an invasion of United States territory by a hostile country, all railroad operation would function under civilian operation behind the zone in which armies are actually operating. Under ideal conditions, civilian operation would be the rule, up to the regulating stations which are located in general from 50 to 100 miles behind the actual front. As our force advances a division length, the rear division will be turned over to the civilian force operating the railroad in rear of it. The military operating force will therefore be constantly in the danger zone and fairly constant in size. Each of the railway battalions in the organized reserve would operate one of the lines from the regulating station to the front. They would handle ordinary maintenance but new construction would be performed by general service regiments. Provision is made in our general mobilization plan for engineer railway headquarters units at the rate of one for each three battalions, to function as general superintendents' offices.

In any war, railway troops will be required in the early stages. There are none in the peace establishment. This shows the confidence that Congress and the war department have in the patriotism of our great railway systems and in their ability to take care of our war needs.

For many years the corps of engineers has pursued a definite plan of recommending the systematic improvement and development of the harbors of the country. Railroad men appreciate the value of our harbors. The army engineer plan has been to develop harbors sufficient in number, adequate in depth and general layout, and so located as to meet the needs of our foreign, intracoastal and coastwise commerce. Here, the railroads serve the ships and the ships bring freight to the railroads. Neither could function adequately without the other.

Under the provisions of certain acts of Congress, it is the duty of the war department to investigate the terminal situation at our ports and to advise and co-operate with port authorities in the preparation of plans for terminal facilities. We are opposed to any undue federal interference with state, municipal or private enterprise. The construction and operation of water terminals are properly duties devolving upon local interests. Since the spending of federal monies on port and waterway improvements demands a national return, the port should so plan its development as to assure its usefulness to the nation. One phase of port and terminal development of importance to all agencies and interests concerned with ports is the question as to whether there is a fundamentally best system for the control and operation of port terminals or whether varying conditions must be met and solved at each port.

Co-operation Between Transportation Agencies

Every development of our country brings new points of contact between us. The latest is the flood situation. The railroads rendered heroic and unselfish service in many ways in the devastating Mississippi flood of 1927. You maintained the best possible service, rescued many, and transported and in various ways tided many more over critical situations. We supervised the water rescue of many others. The army engineers have prepared a plan which has been adopted by congress and when completed will prevent another such catastrophe. In putting this plan into execution, we need co-operation.

No transportation question is more important for the future development of our country than co-operation between railways, waterways and highways. To this trio must soon be added airways.

This problem is one that has not yet been entirely satisfactorily solved. There are three principal parties to its solution: The railroads; the water carriers; and the users of transportation, which means the general public.

The fundamental fact is, that rail and water transportation are complementary; their proper relation is not combat, but co-operation; any other relation is abnormal, wasteful, and against the best interests of all the parties concerned.

There is not the remotest danger that the water carrier will drive the rail carrier from the field. Railroads and waterways will be the backbone of inland transportation. Efficient waterway traffic normally does not flourish where railroads are absent. We are coming to realize the converse, that the most efficient rail traffic depends on using to the limit the waterways. By reducing peak load, by balancing rail hauls, by taking the burden of lowgrade traffic, by preventing car shortages, by enhancing regional prosperity, waterways can be and are becoming an essential element in the railroad's fight for efficiency.

The railroads are equipped to handle all classes of freight. Water transportation, cheaper than any other, is best suited to certain commodities, especially those carried in bulk. Trucks are ideal for comparatively short haul movements where speed is essential. The present use of aircraft is primarily for passenger traffic and the movement of mail and other limited amounts of light, valuable cargoes at great speed. There are numerous instances where two means of transportation have been combined to the mutual benefit of both. Combination air and rail passenger service is already established. The use of trucks to

assemble freight at rail and water heads is becoming more common. The maximum employment of each for its special commodity group releases the others for better service along the lines for which they are particularly fitted.

The policy should be co-operation. The people are recognizing more clearly as the years roll on the advantages and limitations of each utility—water, rail, truck and airways. This country has attained its unsurpassed greatness through individualism, co-operation and the ability eventually to keep its development and growth from being permanently shackled. The people, as a whole, always win in the long run. They want co-operation between their transportation facilities and will eventually have it. Let us co-operate and lead in giving them co-operation of railroad, waterway, highway and air transportation to the common benefit of all these transportation interests and of all the people of the nation.

Report on Yards and Terminals

Designs of coach yards and freight transfer stations are considered as well as weight control of scale test cars

J. E. Armstrong
Chairman

THE committee submitted reports on the following subjects:

(1) Revision of the Manual (Appendix A).

(2) Design and Operation of Passenger Terminals, with particular reference to convenience and economy of operation of coach yards (Appendix B).

(3) Collaboration with Committee on Uniform General Contract Forms on "Form of Agreement for Joint Ownership, Use and Management of a Terminal Project."

(4) Design and operation of freight terminals with particular reference to car-to-car transfer of through l.c.l. freight (Appendix C).

(5) Scales (Appendix D).

(6) Practical Design and Construction of Humps in Terminal Yards.

The committee recommended that the recommendations in Appendix B as well as the revisions concerning scale-test cars in Appendix D be approved for publication in the manual, and that Appendix C, as well as the explanatory matter in Appendix D, be received as information. It also reported progress on the consideration of uniform general contract forms for the joint ownership, use and management of terminal projects, as well as on the construction and design of humps in terminal yards.

Appendix B—Design of Coach Yards

The committee presented a full discussion of the various points to be considered in the location, design, construction and equipment of coach yards, based on returns received from 28 roads in replies to a questionnaire, the data covering 31 different coach yards. The committee embodied its recommendations in the following conclusions:

1. The coach yard should be placed convenient to the station and mechanical facilities.
2. The location of a coach yard should be determined by the economic balance between the following factors:
   (a) Available sites;
   (b) Land values;
   (c) Cost of construction;
   (d) Convenience to the station and other facilities;
   (e) Cost of moving equipment between station, coach yard and engine house.
3. The capacity required in a coach yard depends upon:
   (a) Number of cars and trains to be handled;
   (b) Class of equipment;
   (c) Standard of maintenance;
   (d) Length of layover;
   (e) Frequency of cleaning.
4. It is common practice to hold trains for cleaning and waiting for hours on one track.
5. There are two general types of coach yard layouts: Stub track and through track. There is also an intermediate type made up of through tracks, but operated generally as two systems of stub tracks. Operation is most efficient in a system of through tracks.
6. Tracks of equal length and equal to the length of the longest trains give greatest operating efficiency.
7. A spacing of 18 feet between track centers has proved ample. Where land values are high, spacing may be reduced to 16 feet or to alternate spacing of 14 and 16 feet.
8. Tracks should be arranged in groups at the leads to facilitate switching. Auxiliary leads and tail tracks of ample length should be provided.
9. No turnout sharper than No. 8 should be used.
10. The gradient of coach yard tracks preferably should be level, but in no event should it exceed 0.3 per cent.
11. A wye or loop track should be provided for turning equipment. A loop track is more efficient but requires more space.
12. Special tracks for making up or breaking up trains are sometimes required.
13. Only light or running repairs are made in a coach yard.
14. The track-bed and platform-bed in coach yards should be well drained.
15. Platforms should be placed between all tracks.
16. The surface of the platform should be even with the top of rail. The edge of the platform should be 5 ft. 6 in. from the center of the track. The platform should be $\frac{3}{8}$ in. to the foot.
17. Water hydrants should be placed a minimum distance apart, equivalent to the average length of cars. The usual practice is to place these in alternate spaces between tracks; however, there is a substantial advantage in locating them between all tracks.
18. Hot water is usually provided in tubs at convenient locations.
19. Air connections for cleaning should be spaced the same as cold-water hydrants; for testing air brakes, connections should be provided through a double connection at the center of each track or through single connections at each end of each track.
20. Electrical-supply connections should be spaced the same as water hydrants, but a minimum distance apart equivalent to twice the average length of cars.
21. Steam-supply connections should be provided in the same manner as air connections for testing air brakes.
22. A service building and storehouse should be provided.
23. At least one drop pit, serving two tracks, should be provided in large yards.
24. Provision should be made to store a sufficient number of car wheels.
25. There should be a building for the necessary shop facilities.
26. Refuse disposal, fire protection and floodlighting should be provided.

Appendix C—Design and Operation of Car-to-Car Transfer for L. C. L. Freight

Following a discussion of the various operating and economic conditions which have made stations for the car-to-car transfer of l.c.l. freight desirable on a number of roads, the committee described three such installations: One on the Chicago, Rock Island & Pacific at Chicago, handling from 60 to 80 cars per day; one on the New York, New Haven & Hartford at Cedar Hill, New Haven, Conn., with a capacity of 416 cars at one setting, and the large transfer sta-

tion of the Chicago & North Western at Proviso, Ill., on the outskirts of Chicago, which has a capacity of 570 cars for loading and of 150 cars for unloading. (A description of the Proviso station was published in the November 5, 1927 issue of *Railway Age*—Editor). At the conclusion of the report, which was submitted as information, the committee summarized its suggestions as follows:

1. Car-to-car transfer is necessitated by railways receiving l. c. l. freight in carload lots.
2. Until the tonnage is excessive, the transfer can usually be handled at the least cost at local freight stations.
3. Growth of local receipts and demand for speed may require separate transfer facilities for carload l. c. l. freight not consigned to local points.
4. Separate transfer may be best if heavier loading and quicker distribution can be obtained without excess cost.
5. Costs in connection with the maintenance of a combined station should be compared with the costs of two separately operated stations, giving due consideration to cost of delay to freight, before decision is made.
6. A questionnaire developed that 55 per cent of the railway mileage in the United States and Canada maintained 31 exclusively operated l. c. l. car-to-car transfer stations.

Appendix D—Scales

On this subject, the committee confined its report to the consideration of the control of weight for scale test cars. Recognizing that a master scale is essential for the best results in these efforts it gave a list of such scales; the location of each, together with the name of the owner, being as follows:

Railway Owned

Owner	*Location*
Atchison, Topeka & Santa Fe	Topeka, Kan.
Atlantic Coast Line	Jacksonville, Fla.
Baltimore & Ohio	Martinsburg, W. Va.
Chicago, Burlington & Quincy	Havelock, Neb.
Illinois Central	Centralia, Ill.
Missouri Pacific	Sedalia, Mo.
Norfolk & Western	Roanoke, Va.
Pennsylvania	Alliance, Ohio
Pennsylvania	Altoona, Pa.
Oregon Short Line	Salt Lake City, Utah
Reading	Reading, Pa.
Southern	Charlotte, N. C.
Southern	Chattanooga, Tenn.
Southern Pacific	Oakland, Cal.
Union Pacific	Denver, Colo.

Other Than Railway Owned

U. S. Bureau of Standards	Chicago
Carnegie Steel Company	Braddock, Pa.
Minnesota Railroad & Warehouse Commission	Minnesota Transfer, Minn.
Oregon Public Service Commission	Portland, Ore.
Winslow Scale Works	Terre Haute, Ind.

Each of these scales is tested by the U. S. Bureau of Standards at intervals of approximately one year and practically all of them are available to others than the owner, usually upon the payment of fees ranging from $7.50 to $25 per car.

The committee recommended that scale-test cars should be weighed on master scales at intervals of not to exceed three months and that the weights should be adjusted to multiples of 10,000 lbs. It also suggested various precautions to be taken to avoid variations in weight and recommended that the following changes be made in certain paragraphs in the "Rules for the Location, Operation and Testing of Railway Track Scales" in Section IV—Scale Test Cars in the Manual.

Section VI—Test Weight Cars

2. Test weight cars should have following characteristics:

(i) Roller or ball bearings of proper design, preferably the former.

3. Test weight cars should preferably be of the self-contained type with solid body in which a small space is provided for a limited number of test weights. When it is impracticable to provide a self-contained car, a compartment car, with body of structural and plate steel, at least one-half of the weight of which consists of test weights carried in the compartments, may be found to be serviceable.

4. Test weight cars should be handled on the rear end of trains, just ahead of the caboose.

5. Test weight cars should not be kept in trains in yards during switching, but should be so placed that rough handling will be avoided. In no case should these cars be subjected to impact at a speed greater than two miles per hour.

7. Test-weight cars should be calibrated on a certified master scale before being started on each general test strip, and not less frequently than once every three months. At the time of calibration, the actual weight of the car should be made equal to its nominal weight, which should be a multiple of 10,000 lbs.

8. Each test-weight car should be in the care of but one scale inspector between calibrations, and he should be held personally responsible for the maintenance of the correct weight of each car in his care. To this end, the following rules should be enforced:

(a) No repairs to any test-weight cars may be made except in the presence of the scale inspector in charge thereof.

(b) Journals of test-weight cars may not be repacked unless directed by the scale inspector in charge thereof.

(c) Each test-weight car should carry a conspicuous badge plate, visible from either side of the car, and carrying a notice to the following effect:

"Do not oil or repack boxes or make repairs to this car unless directed by scale inspector."

(d) Should any change be made in the weight of a test-weight car, it is the duty of the scale inspector to determine the amount of such change and immedi-

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*Mr. Johnston died on November 8, 1928.

ately to make suitable correction. If the change in weight cannot be determined satisfactorily, the car should be returned to the master scale for calibration before again being used.

9. The nominal weight of each test-weight car should include the car proper and everything contained therein, excepting only such material as is specifically carried as supercargo. This material, consisting of tools, over clothes, etc., when carried, should be contained in a removable steel box, the outside of which should be stencilled to show that it is not a part of the test load. This box and its contents must be removed from the car when being calibrated and when used for testing track scales.

10. When a test-weight car is returned to the master scale for any reason, the actual weight of the car upon its arrival should be determined and recorded. Any unusual variation between that weight and the nominal weight of the car should be promptly and fully investigated.

11. After the weight of the car on its arrival at the master scale has been determined, the car should receive any heavy repairs which are needed or may be needed before the next trip to the master scale, and should be thoroughly cleaned. At this time the axle bearings should receive any necessary lubrication and packing; after this has been done the car should be calibrated as outlined in paragraph 7 hereof.

Discussion

[The report was presented by Chairman J. E. Armstrong (C. P. R.), who called upon Subcommittee Chairman Irving Anderson (A. T. & S. F.) to submit that portion referring to the Design of Coach Yards. Mr. Anderson's motion that the conclusion be approved and placed in the Manual was carried.

Subcommittee Chairman L. L. Lyford (I. C.) then presented the report on the design of stations for the transfer of l. c. l. through freight, which was submitted as information with the recommendation that the subject be discontinued.

The report on Scales and Test Weight Cars was presented by Subcommittee Chairman M. J. J. Harrison, who moved that *the suggested revisions in the Rules for the Location, Operation and Testing of Railway Track Scales be approved.*]

W. C. Barrett (L. V.): I should like to ask if the committee would be willing to have a subcommittee of our Committee on Rules and Organization go over this matter which it has submitted. We don't want to trespass, but it seems that some of that matter might possibly go into the Manual of Rules.

Chairman Armstrong: Does Mr. Barrett mean to have a consultation as to the inclusion of this as part of the rules?

Mr. Barrett: If you would be willing to confer with some of our committee, that part of it might be transferred to our Manual.

J. V. Neubert (N. Y. C.): There seems to be some question as to the air brakes. Your standard cars, I believe, are piped for air but have no air brakes. A number of railroads have one and some another.

Chairman Armstrong: There is nothing in this report regarding that particular feature. That was a subject which the committee hesitated to mention at all, being a matter which might possibly be considered as treading on the toes of the Mechanical division of the A. R. A.; and there is also to be considered the Interstate Commerce Commission's requirements in regard to air brakes in operated trains. I might say that the committee has definite opinions on this particular subject which it has not expressed in this report. If Mr. Neubert has any thoughts that would aid in covering that point, the committee will be very glad to have them.

Mr. Neubert: The New York Central has cars with air brakes. We have had the matter under consideration and advisement for quite a while. I do not believe the Pennsylvania has brakes on the cars, but they are piped for air. We also took the matter up with the Bureau of Standards, and was advised that its cars are piped for air.

[*The motion to approve the revisions for inclusion in the Manual was carried.* The report on the Design and Construction of Humps in Terminal Yards was then presented as information by Subcommittee Chairman R. J. Hammond (B. & M.), following which the committee was excused with the thanks of the association.]

Report of Committee on Rivers and Harbors

First year's work brings out valuable information on levees and dikes, and river bank protection

W. G. Atwood
Chairman

THE report of the committee covered the following subjects:

(1) Methods for providing against river bank erosion.

(2) Determine the best types of construction for levees and river dikes for flood protection giving recommended dimensions.

(3) Determine the proper allowance for swell in scow measurement dredge work.

(4) Determine the proper amount of allowable overdepth in dredging to obtain the required operating depth.

(5) Determine the average deposit in fresh water rivers bearing silt and in brackish waters in the tidal range.

(6) Prescribe the best approved method of taking soundings in river waters, in tidal waters, with both hard and soft bottoms.

(7) Ascertain the usual slopes taken in deep waterways for quiet waters and those affected by wave action.

(8) Determine the effect of slight salinity on deposit of silt in rivers and slips.

(9) Study the result of deepening channels on the salinity of rivers and estuaries.

This being the first year of the work of this committee, it was unable to make final recommendations on any of the subjects assigned, and therefore, the report was submitted as a progress report, for information only.

The committee recommended that all of the subjects be reassigned, and that the following subjects be added:

(10) Prepare definitions for terms connected with river and harbor construction, protection and maintenance.

(11) Prepare specifications covering the several types of river protection work in common use.

(12) Report on the various types of dredges and indicate their respective use.

(13) Present specifications for dredging.

Appendix A—Rivers

Subjects 1, 2, 5, 8, 9, and 10 were assigned to a sub-committee, which reported that insufficient reliable information was obtained to make possible a progress report this year.

Appendix A-1—Methods of Protecting River Banks Against Erosion

The committee sent out a questionnaire to secure information on this subject, but reported that it had not completed its investigation. Following are abstracts from the progress report presented by the committee:

General.—Many different methods have been followed in bank protection, depending upon local conditions. In addition to the better known methods of bank protection, such as the use of willow mattresses, riprap, and concrete, many patented devices and schemes have been offered, some of which are of doubtful value and relatively few of practical application.

Brush Mattresses.—The "willow mattress" has probably been more extensively used for bank protection than any other form of revetment, the principal reasons for its extensive use being its flexibility, which permits it to conform to the shape of the bank and also to the fact that the growth of willows and other brush along the stream usually provides material in a convenient location for the construction of the mattresses. The construction of this type of mattress in the past has been confined chiefly to the larger streams.

Among the various types of willow mattresses are; the Missouri River standard basket woven mat, the brush and weaving pole mat, the pole and fascine mat, and the brush mat enclosed in a wire envelope. The last mentioned mattress is patented and is made by sewing together six inch square mesh netting made of No. 9 wire unwinding the rolls comprising the lower layer parallel with the shore of the stream and sewing the edges of the rolls together with No. 9 wire. Willows are then placed on top of the lower netting, the first layer at right angles to the river bank line and the second layer parallel with the bank, making the thickness about 12 in. About ¼ cu. yd. of stone per 100 sq. ft. of mattress is then placed on the willow brush. No stone should be larger than what is ordinarily termed one-man stone. Another layer of wire mesh is then placed on top of the stone and brush, the rolls being unwound and sewed together at their edges at right angles to the lower netting. The lower and upper layers of wire mesh are then sewed together with No. 9 wire at intervals of 30 in. each way. That mat is either made on a barge and sunk in the river or it can be placed on the bank flat, letting it gradually fall into the river as the shore line scours away.

Board Mattresses.—A mattress constructed of boards or planks is an effective form of protection and will have approximately the same life as a willow mattress when used under similar conditions. The principal objection to the board mattress as compared to the willow mattress is the difficulty of providing sufficient voids for the retention of the sediment deposited and the ballast required to hold it in position during recurring floods.

Concrete Mattresses.—The use of concrete mattresses is still in the experimental stage and very little is known as to their durability or cost. The Mississippi River Commission has been experimenting for a number of years with concrete as a substitute for the sub-aqueous willow mattress, or mat as it is commonly termed.

After describing briefly early experiments with concrete mattresses on the first and second Mississippi River Commission districts, the following was said with reference to the present type of construction on the third Mississippi River Commission District:

The concrete mats as now built are reinforced slabs 3 ft. 11 in. long, 11½ in. wide and 3 in. thick. These slabs are reinforced and connected by 12 by 12 in. wire mesh of No. 7 steel wire. In building the mats the reinforcing mesh is cut in strips 25 ft. long and 48 in. wide, thus forming 25 slabs in each mat unit which is 4 by 25 ft. or 100 sq. ft. The mat units of 25 slabs weigh about 2,500 lb. In placing these mats the ends of the units are fastened together at intervals of 12 in. and are attached to steel cables placed between the units at intervals of four feet. The projecting edge of the reinforcing mesh is fastened to the cables at 12 in. intervals.

Riprap Protection.—Riprap is used extensively in bank protection, particularly on railroad embankments. Ordinarily riprap is used to face the bank from the low water line to a point above the high water line for the purpose of preventing scouring where current prevails, and also for the prevention of wave-wash due to winds. Where stone is not available for riprapping, concrete paving is sometimes used instead.

Sheet Piling.—Sheet piling of steel, concrete or timber is used principally in congested areas, as for example around wharves, docks, harbors, etc., where space will not permit of other forms of protection. The cost of sheet piling is usually considerably in excess of other forms of protection.

Spur Dikes.—The use of spur dikes is confined very largely to rivers with sand beds. It is extremely difficult to maintain spur dikes on concave banks and therefore their success has been almost altogether on convex banks, where as a general rule a bar is quickly formed below the dike. Dikes may be formed of piling driven below the water line, riprap and heavy stone, brush mats properly anchored to place, or in fact, almost any material that will remain in position and retard the flow of the water to such an extent that a deposit will form below it.

Spur dikes are also constructed of steel and wire entanglements designed to collect silt and drift and form bars. This type has been found very effective on certain heavy silt bearing streams of shallow depth and high velocity.

Pile dikes vary in type of construction from a continuous row of piling spaced a sufficient distance apart to permit of the water passing through the piles to what is sometimes known as the "hurdle dike," which is constructed by driving alternate clusters of two, three or four piling with horizontal piles tied to the clusters varying distances from the bed or bank of the river. These dikes are designed to permit of the free passage of the water, at the same time retaining drift which causes a bar to form below the dike.

Where it is necessary to hold a permanent bank on the concave side of a bend the value of dikes or retards is open to question, due to the fact that the dike is essentially an instrument for channel deflection or changing, best located at a point remote from the point of attack for the purpose of diverting the channel either as to position or direction.

Erosion Occurrence.—The stage at which erosion occurs depends upon the character of the bank. As a general rule the greatest damage occurs principally on a falling river immediately following a flood stage. For example, on some rivers the soil texture is such that the bank will stand almost vertical. Therefore, a softer stratum at the bed is supported to a certain extent by the weight of the water at bankful stage, but as the stage of the river drops this lower stratum has a tendency to scour out, causing the vertical banks to settle, crack off and drop into the stream. This, of course, does not occur where there is a good, firm stratum from the top of the bank to below the bed of the river. Conditions vary to such an extent that no set rule can be laid down.

The finer materials of light specific gravity give the greatest trouble from erosion; clay or gumbo banks are usually the most stable. Irregular formation of the banks, as, for example, a soft or sandy stratum underlying the surface, will often result in erosion of the underlying sand and caving banks. As a rule where the material is of a uniform coarse nature it will form a sloping bank and give less trouble from erosion.

In connection with the discussion of erosion occurrence, the committee's report contained extended ref-

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erence to bank erosion on the Mississippi river at Memphis, Tenn., and Helena, Ark., and to the methods which were employed to stop the erosion.

Appendix A-2—Construction of Levees and River Dikes for Flood Protection

The report of the committee on this subject, which was offered as a progress report, is given in part as follows:

Levees and dikes for flood protection may be roughly divided into five general classes, based upon materials used for construction, namely, earth, masonry, loose rock, and timber, concrete and steel sheet piling. The factors determining the kind of levee or dam to be constructed are: the character of the foundation, space available, height of dam, availability of material and cost.

A levee properly constructed of earth is a perfectly safe structure. It can be built on a wide variety of foundations, and most important of all it is the cheapest form of construction within certain limits.

Design of Earth Levees.—It has been said that no mathematical formulæ or even general rules can be laid down for the design of earthen levees or dams. More important than dimension or design is the careful selection of material and care in construction.

Earthen embankments or levees may be divided into five general classes: (1) Simple embankment built up in layers of homogeneous material without core; (2) Levees with a central core or wall of puddled earth or masonry; (3) Levees with a central core of steel, concrete or timber sheet piling; (4) Levees built by a hydraulic fill; (5) Levees with puddle or masonry facing.

The function of an earth levee, as well as any other type, is to prevent the passage of water. Therefore, a heavy, tenacious natural impervious earth is the most desirable. In the classification of material, hardpan, natural glacial drift and till are among the most desirable; some mixtures of sand, gravel and clay also make an excellent embankment.

Foundations.—While there is but little information available in regard to foundations for earth levees the foundation and its preparation are important factors affecting their stability. The character of the material forming the foundation will determine to a very large extent the slopes of the levee, as while definite slopes may be established for certain heights, poor foundation conditions may necessitate increasing them.

Vegetation and top soil should be removed from the area to be covered by earth levees. If the foundation material is not firm it should be compacted by rolling or other means. Tree roots should be grubbed out and all vegetation and pervious material removed.

Character of Material.—The character of material used and the method of construction are of almost equal importance, as both are essential to a satisfactory structure. If the material available is inferior more care will have to be exercised in the construction.

The poorest material for an earth embankment is sand or gravel on account of the porosity of the material; however, embankments have been formed of sand, loam and gravel successfully. A bank of this kind will eventually become impervious to water where the water contains silt or mud. It is, of course, necessary that such embankments be constructed only of moderate height.

It is sometimes practicable to construct a safe levee with poor material by placing a core-wall of concrete, puddle or sheet piling. It is also sometimes advisable to puddle the river face and protect the land face with sod or riprap.

Core-walls.—Impervious core-walls are practical and are used quite extensively. There is a question, however, whether the same result could not be secured by flattening the slopes and increasing the width of levee base. A puddle core is the cheapest and is effective when properly constructed. Puddle core-walls should be constructed of carefully selected materials. Clay, sand and gravel form an excellent mixture for the construction of puddle cores; no stone should be permitted in the core larger than two inches. A concrete core-wall may be made much thinner than a puddle wall, although the same method should be followed in excavating to impervious earth, and the wall should be carried at least to the line of saturation.

Continuing, the report covered the placing of material in the construction of levees, the hydraulic filling method, the subject of levee dimensions, settlement of levees, and their protection against erosion and burrowing animals.

Appendix B—Harbors

The committee made a brief progress report on subjects Nos. 3, 4, 6 and 7. The subjects cover: Allowance for swell in scow measurement work; allowable over-depth in dredging operations to obtain the desired operating depth; usual slopes taken in deep water; and, sounding methods in river and tidal waters. It conclusion, the committee recommended that its work be continued and that the three following subjects be added:

(1) Prepare definitions for terms connected with harbor work.

(2) Work up general information relative to types of dredges and their respective uses.

(3) Specifications for dredging.

Appendix A-3—Protection and Maintenance of Levees During Flood

This appendix to the report on levees, was rather extended and covered the subjects of caving, sloughs, topping, wave wash, boils and crevasses. The subject matter in this part of the report, which was quite extensively illustrated, consisted principally of suggested methods of protecting levees during floods, taken from the instructions to levee engineers, inspectors and supervisors, prepared by H. N. Pharr, chief engineer of the St. Francis Levee District of Arkansas.

Discussion

[The report was presented by Chairman W. G. Atwood (consulting engineer).]

Col. Atwood: This year's report is largely historical. We were greatly assisted in the obtaining of data by the Corps of Engineers, the Bureau of Yards and Docks of the Navy, the Coast Survey, and several other government departments. Two questionnaires were sent out to the railroads, but the replies were not received in time to be tabulated and included in this year's report. The committee has a large amount of data in hand which has not yet been digested and studied, but we hope to furnish a more comprehensive and more accurate report next year.

[The report of the subcommittee on Handling River Problems was presented by E. A. Hadley (M. P.) and was followed by the report on Rivers and Harbors by W. L. Morse (N. Y. C.).]

Mr. Morse: A questionnaire was sent to all of the railroads and to the various departments of the Engineering Organization of the United States Army, and from those we found 27 railroads that were without experience on questions of swell in scow-measurement dredge work, allowable over-depth in dredging operations to obtain the desired operating depth, the usual slopes taken in deep waterways, and sounding methods in river and tidal waters. But there were some 24 railroads that had had experience, and in addition we obtained information from the Washington, Boston, New York and Duluth offices of the United States Engineers' War Department, from the Navy Department at Washington, and also from the Department of Public Works, Commonwealth of Massachusetts.

P. T. Simons (M. P.): It occurs to me that in an assignment of work to a committee which is to consider flood control, the subject of drainage should be included. Drainage in its broad sense is the mode by which the waters of a country find their way to the sea. Under that definition of drainage, flood control is a part of drainage. I do not find in this assignment any reference to that broad definition of

drainage, and my study of drainage during the past 20 years and particularly the discussion of drainage at the National Drainage Conference which met in Memphis, Tenn., two weeks ago, brought out that feature. I should like to suggest that that be considered by the Committee on Assignment of Work.

Vice-president Yager: We are glad to have that suggestion, and it will be placed before the Outline of Work committee for consideration.

[The report was accepted without further comments and the committee excused with the thanks of the association.]

Report on Rules and Organization

Additional rules are submitted for the guidance of employees in the maintenance of way department

W. C. Barrett
Chairman

THE following subjects were reported upon by the committee:

(1) Revision of the Manual.

(2) Study and report on rules for the guidance of employees of the maintenance of way department, with special reference to: (a) Rules for employees who operate and maintain motor cars (Appendix A); (b) Rules for maintenance of buildings (Appendix B); (c) Rules for maintenance of bridges; and (d) Rules for maintenance of other terminal structures (Appendix C.)

(3) Study titles below rank of division engineer, which are employed to designate positions of corresponding rank in maintenance of way service, and make recommendations that will promote uniformity in nomenclature (Appendix D).

(4) Prepare rules for fire prevention as applying to railway property (Appendix E).

The committee recommended: (1) That no changes be made in the Manual this year; (2) that the new rules offered in Appendices A and B be approved for inclusion in the Manual; (3) that Appendices C and E be received as information; and (4) that the titles shown in Appendix D, be adopted.

Appendix A—Rules for Employees who Operate and Maintain Motor Cars

The committee offered the following rule, No. 297 which it recommended be included in the Manual under "Rules for the operation of motor, hand, velocipede and push cars:"

297. If car is started with a crank, it must be pulled upward holding thumb against forefinger when the charge is being compressed in the cylinder, to avoid injury to the person cranking the car in case the engine should backfire.

The committee also offered the three following rules which it recommended for publication in the Manual as additional rules for the guidance of employees of the Maintenance of Way department.

651. Borrow pits or low spots must be drained or filled.

661. Rough ground (or surplus ditching material) must be smoothed to permit use of mower.

692. Material taken from cuts or from right-of-way along embankment for general widening or for other purposes, must be so handled that both the place from which it is taken and the place where used will be finished in a workmanlike manner and leave the surface smooth and of good appearance.

Appendix B—Rules for Employees of the Buildings Department

The following rules were recommended by the committee for inclusion in the Manual as rules for the guidance of employees of the maintenance of way department:

Construction

1661. Whenever practicable, buildings must be located on the outside of curves and far enough from road crossings to avoid obstructing the view of trainmen or of travelers on the highway.

1662. Local laws and permits required by municipalities must be complied with and all necessary permits must be obtained.

1663. Alterations or additions not covered by plans must conform as nearly as possible in appearance to the main building to which they are attached.

1664. Proper authority must be obtained before the construction of any building.

1665. Work in progress must always be kept safe for trains, the public and for employees. Each piece of work must be completed before going to another, except in case of emergency.

1666. High platforms and buildings on timber foundations must be enclosed to prevent accumulation of paper, rubbish, scrap, etc.

Maintenance

1668. Cornices, gutters, downspouts, and other places of lodgment must be kept free of obstructions.

1669. Maintenance of all portions of buildings and structures not easily accessible, such as roof trusses, rods, cornices, under supports, gutters, downspouts, inside posts and braces, must be given special attention.

1670. Report must be promptly submitted to proper official covering buildings on property leased from the railroad and owned by outside parties, that are not properly maintained or painted.

1671. In order that the insurance schedule may be kept up-to-date all changes, either in renewals or repairs, which may in any way affect the value of the building or structure, must be reported through the proper channels.

1672. If a building or other structure is burned or damaged, an inspection and report must be made as soon as possible, giving the nature and extent of the damage, with an estimate of the cost of repairs.

1673. Foremen in charge of work must supervise the construction of scaffolding to see that it is safe.

Construction and Maintenance

1674. The date of erecting and painting of all buildings must be plainly indicated on the structure in an inconspicuous place and preferably covered for weather protection.

1675. In constructing and maintaining buildings and platforms, careful consideration must be given to proper drainage, to permanent alignment and grade of tracks, to public improvements and to future changes.

1676. Buildings and other structures must be constructed and maintained with standard clearances. Special authority must be obtained to vary therefrom.

1677. Main line passenger and freight platforms built new, must be located with reference to track and in accordance with standard plans, and old platforms changed or renewed must be brought to standard where practicable.

1678. Runways or ladders must not be located under scaffolds, or at other points where tools or material are likely to fall, and where a considerable amount of work is in progress barricades must be erected.

1679. Rope and tackle scaffolds which have been stored or

shipped must be thoroughly tested for deterioration or injury before being used.

1680. Bulletin boards must be provided in or around completed structures for the posting of notices.

1681. Station signs must be placed in conformity with the prescribed standards and maintained in good condition.

Appendix C—Rules for Maintenance of Other Terminal Structures

The following rules were submitted for information only:

Oil Houses

(1) Oil storage facilities must be kept thoroughly grounded at all times and maintained in such a way that all pipes and connections will be tight.

Coaling Stations

(1) Special attention must be given to maintenance of bins, chutes and working appurtenances of all coaling stations.

(2) Inspection must be made from time to time and corrective measures taken to keep shed free from dirt, coal dust or screenings.

Ash Pits

(1) Where brick or concrete materials form any part of support of track over pit, particular attention must be given to the maintenance of these pits.

(2) Steel beams supporting tracks must be watched to see that the hot cinders have no effect on their strength and the rail fastenings kept in proper order.

(3) Water supply must be maintained at all times and strict supervision maintained to see that cinders dumped from locomotives are immediately wet down to keep the heat away from side walls and track supports.

(4) Drainage must be looked after frequently to see that catch basins are cleaned out to prevent ashes from being washed into the sewer.

Turntables

(1) All refuse and dirt must be kept off the deck and out of the pit at all times.

(2) Center bearing of turntables must be kept clean, properly lubricated and in good working condition. At certain intervals turntables must be jacked up so as to make careful examination of center, at which time it must be cleaned and thoroughly lubricated.

(3) Top flanges and cross bracing of turntables must be kept clean and when tie renewals are made top flanges given a coat of paint. At proper intervals entire table should be cleaned and painted with approved structural steel paint.

(4) Inspection of and maintenance of turntables must not be undertaken without first notifying the operator.

(5) In severe weather fires must not be built around turntables in such a manner as to damage the steel structures, to assist in turning. Where heat is necessary steam connections must be used when available.

Track Scales

(1) All track scales must be numbered and referred to by number and location.

(2) Extensive repairs to scales, such as renewal of or sharpening of pivots, should be made in a properly appointed shop.

(3) When scales are in service regularly, scale parts, substructure and foundation must be cleaned at last twice a month. Exposed parts so located that they are liable to become clogged with ice or dirt, must be cleaned more often.

(4) The best rust preventatives obtainable must be applied to pivot and heavy steel bearings in such a manner as not to interfere with the proper working of the scale.

(5) Salt must not be used around scales. Artificial heat should be used.

(6) Equipment must not be allowed to stand on the scales except when being weighed.

(7) Engines or similar heavy equipment must not be passed over the live rails.

(8) Cars on the live rails must not be moved by cars or engines on the dead rails, or vice versa. Cars must not be moved over the scales with one truck on the live rails and another truck on the dead rails. Cars must not be stopped on the scale by impact, by the sudden application of brakes or throwing obstructions under the wheels.

(9) Sand must not be applied or injector used when on the scale. The slipping of engine drivers on either live or dead rails is injurious to the structure and must be avoided.

(10) The weigh beams should be balanced before the scale is used; when not in use, should be secured by the beam catch and with the poise set at the highest graduation.

(11) Scale houses and beam boxes must be kept locked when not in use.

(12) Where compressed air facilities are available provision must be made for loose hose connection so that dust and dirt can be blown off the scale.

(13) Where compressed air facilities are not available provisions must be made for the connections with weigh engines for blowing dust and dirt from scales.

Appendix D—Study of Titles Below Rank of Division Engineer

Following is a summary of the replies received by the committee as the result of a questionnaire sent to 66 roads:

1. Division Engineer is title of chief maintenance officer on division.

2. Supervisor of Bridges and Buildings is the title assigned to the supervisory officer responsible for maintenance of bridges, buildings and structures.

3. Supervisor of Water Service is the title assigned to the supervisory officer responsible for maintenance of water service.

4. Supervisor of Signals is the title assigned to the supervisory officer responsible for maintenance of signals.

5. Supervisor of Telegraph and Telephones is the title assigned to the supervisory officer responsible for maintenance of telegraph and telephones.

6. Supervisor of Track is the title assigned to the supervisory officer responsible for maintenance of track.

7. Supervisor of Work Equipment is the title assigned to the supervisory officer responsible for work equipment.

The committee recommended that the above titles be adopted to promote uniformity in nomenclature of maintenance titles.

Appendix E—Rules for Fire Prevention in Railway Terminals

The committee submitted the following rules for information, expressing its appreciation to the Railway Fire Protection Association for the assistance which it rendered in the formation of the rules.

Fire Protection Begins With Proper Design

(1) The terminal must be designed with sufficient fire roads, crossing as few tracks as possible. Fire roads must be easily accessible to any municipal fire equipment and so located that all structures will be on or adjacent to fire roads. They must be designed with easy turns permitting rapid movement of motorized equipment.

(2) In locating facilities within the terminal, consideration must be given to hazard from adjacent burning property.

(3) Structures must be placed as far apart as their design

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and use will permit, segregating those with greater fire hazard and locating all in a manner which will permit isolation and prompt quenching of fires. Fire risk in important structures must be subdivided into distinct areas by fire walls, where practicable.

(4) Temporary housing facilities, often erected during abnormal labor conditions, or recreation or reading rooms must not expose valuable or essential structures to undue fire hazard. Clear exit passages inside, and unobstructed passage space outside must be provided for these structures.

(5) Lumber and tie storage yards must be placed at least 100 ft. from all important structures and a safe distance from all tracks where engines are operated frequently. Yards must contain clear spaces 100 to 200 ft. wide to divide the yard into distinct fire areas. In congested areas where impracticable to provide clear spaces of the width desired a number of water monitors may be concentrated on a certain area of material, which, when drenched, will provide a substitute fire break. Adequate clearance must be provided around fire hydrants and water monitors to insure against interruption of their operation in event of fire.

(6) Cotton storage sheds must be located at least 80 ft. from any other structure or frequently used streets or highways, and must be located to avoid, as much as possible, hazard from locomotive sparks.

(7) Coal storage sites must be well drained and free from exposure to any external heat. Sufficient area must be provided to accommodate volume necessary without piling coal more than 12 ft. high.

(8) Oil storage tanks and structures containing other inflammables or explosives must be located, installed and protected according to the regulations of the Railway Fire Protection Association and the National Board of Underwriters.

(9) Viaducts with long wooden roadways must be provided with roadway panels of fireproof material at intervals sufficient to prevent fire traveling entire floor of structure. In important structures it may be desirable to provide a pipe line which can be used as a water main during fire.

(10) Pipe lines must be of loop or grid design with adequate size main, with valves located to by-pass any rupture of the line. This system must be connected to a municipal water supply where available. Hydrants and outside stand pipes must be easily accessible from the fire roads, with hydrants located not less than 50 ft. from any structure. All hydrants must be two way with standard connections. Where motor fire trucks are used it may be desirable to have hydrants equipped with steamer connections.

(11) The terminal must include storage tanks of sufficient capacity to insure adequate water supply to quench the largest fire possible on the property. An elevated tank of 100,000 gal., or more capacity, constructed to a height of 100 ft. to the underside of tank, gives reasonable working pressure at all times. To insure adequate pressure the water lines from the tanks must be so arranged that they may be directly connected for fire fighting purposes with an approved fire pump of sufficient capacity. Structure housing fire pump must be fireproof and isolated from other structures.

(12) The terminal must include sufficient hose cart houses, hose carts and other equipment easily accessible to fire roads and hydrants. Hose carts, properly housed and equipped, must be located to cover definite areas and be available for reinforcing any unit in case of fire. Hose houses of standard mill yard type must be located over hydrants with hose attached to hydrants and controlled by independent cut-off valve where protecting congested districts or structures of large value.

(13) The design must include an automatic fire alarm system for all structures or a manually operated system with boxes so located that it should not be necessary to travel over 200 ft. to register an alarm. When permissible a non-interfering system if used must be hooked into the city fire alarm system; if any other system, it must be connected through a master box to the city fire alarm. The local alarm must be connected to and automatically sound in code, a siren to indicate the location of the alarm.

(14) In certain classes of railroad structures where large values in buildings exist and often greater values in contents are subject to fire loss, approved automatic sprinkler system must be installed.

Discussion

[Chairman W. C. Barrett (L. V.) introduced the report and called upon Subcommittee Chairman M. M. Backus (I. C.) to present that portion relating to rules for guidance of employees of the maintenance department. The subcommittee submitted three sets of rules as follows: Employees Who Operate and Maintain Motor Cars; Care of Right of Way, and Care of Roadway; with the recommendation that they be approved for inclusion in the Manual, and a motion to that effect was carried.

Subcommittee Chairman B. R. Kulp (C. & N. W.) then presented Rules for Employees of the Building Department for approval for the Manual. These rules were presented at the 1928 convention but were referred back to the Committee on Rules and Organization and the Committee on Buildings, who recast them with a view to a closer differentiation between rules and specifications.]

R. H. Ford (C. R. I. & P.): I should like to inquire in what way the committee has changed the rules and specification as defined by the Board of Direction and sent to the committee for incorporation in its report. This question of rules and specifications was adopted after the most painstaking study and, with all due regard to the committee, I don't consider there was any need of any changes.

Mr. Kulp: We made one or two slight changes.

Mr. Ford: What does that mean?

Mr. Kulp: We made the change to make the rule mandatory, and in the next place there were one or two rules that, according to this definition, we thought pertained a little more to specifications, so we corrected them, as you remember.

Mr. Ford: Is the committee reporting back those two definitions in the form that they were sent to the committee? If they have changed them, I should be glad to know in what way.

Mr. Kulp: If I understand, you refer to these rules on specifications. If so, I will let Chairman Barrett answer that.

Chairman Barrett: Mr. Ford wrote to me direct with reference to a new definition of a rule and a new definition of a specification which the board had adopted to take the place of those previously adopted, and the previous rules that this committee had prepared with reference to building were prepared in accordance with the old definitions. When we got these new definitions, which the committee thoroughly understood from Mr. Ford's letter had been approved by the Board of Direction and substituted for the others, we immediately revised the rules so far as we were able in accordance with the new definitions. We made no change whatever in the definitions; the only changes we made were in the rules in order to make them comply with the definition.

Mr. Ford: The explanation is satisfactory.

C. W. Baldridge (A. T. & S. F.): In regard to showing the date of erecting and painting being "covered for weather protection." I would suggest that the words, "covered for weather protection," be changed to read: "where sheltered from the weather."

President Faucette: The committee accepts the suggestion.

[The motion that *the rules be governed for inclusion in the Manual* carried. The report on titles below the rank of division engineer was presented by Subcommittee Chairman R. D. Brooke (C. & O.), and his motion that *the titles shown be approved for inclusion in the Manual was carried.* The report on rules for fire prevention as applying to railway property were then presented as information to Subcommittee Chairman W. C. Mack (C. R. I. & P.), following which the committee was excused with the thanks of the association.]

Report of the Committee on Track

Frog plans, superelevation, crossing layouts, track tools and rail wear on curves are subjects this year

John V. Neubert
Chairman

THE committee reported on the following subjects:

(1) Revision of Manual (Appendix A).

(2) Review the material now appearing in publications of the Association relating to curve elevation; ascertain existing views and practices of the railways; and recommend such changes as are found desirable (Appendix B).

(3) Study detailed plans of switches, frogs, crossings and slip switches (Appendix C).

(4) Study track construction in paved streets (Appendix D).

(5) Design and specifications for foundations under railway crossings; also proper methods for tie spacing and timbering under railway crossings (Appendix E).

(6) Methods of reducing rail wear on curves, with particular reference to oiling the rail or wheel flanges, collaborating with the Committee on Rail (Appendix F).

(7) Review material in former Proceedings with respect to the cause and effect of brine drippings, collaborating with the Committee on Rail and the Committee on Iron and Steel Structures (Appendix G).

Prepare plans and specifications for track tools (Appendix H). (Not specifically assigned.)

It recommended:

(1) That the changes in the Manual, outlined in Appendices A and B, be approved and that revised version be substituted for the present recommendations in the Manual.

(2) That plans in Appendix E and certain plans in Appendix C be adopted as recommended practice and published in the Manual.

(3) That further data as outlined in Appendix C, also reports on other subjects as outlined in Appendices B, F, G and H be received as information.

(4) That Appendix D be received as a progress report.

Appendix A—Revision of Manual

The committtee recommended the following changes in the Manual: Withdraw graphic chart shown on page 189 of 1921 Manual, entitled "Speeds of trains on curves—overturning speeds—resultant through gage line—Height of center of gravity 84 in."; and change the equivalent of s in the first paragraph on page 184, under the formula for the elevation of curves, $E=.00066DS^2$, to read, "S—Speed in miles per hour, will give essentially correct theoretical elevations for the outer rail of curves, in which the resultant of forces passes practically through the center line of track." It also recommended adding the following sentence to the matter on page 184 of the Manual.

There will be found on page 899, Vol. 30 of the 1929 Proceedings a comparison in tabular form of curve elevations for equilibrium speed with "comfortable," "safe," and theoretical "overturning" speeds.

The committee presented revised tables for Classes "H" and "J" for self-guarded solid manganese frogs and for designs No. 1 and No. 2, solid manganese frogs to replace those withdrawn in 1927 and with this revision and other revisions for consistency with later plans, these plans (No. 640, No. 643 and No. 670), as noted below were offered for adoption as recommended practice, and it was recommended that the old plans of these numbers be withdrawn from the Manual.

Plan No. 640. Standard dimensions for self-guarded frogs, solid manganese steel type.

Plan No. 643. No. 8 self-guarded frog, solid manganese steel type.

Plan No. 670. Standard dimensions for solid manganese steel frogs.

The committee also recommended the addition of notes to a considerable number of its plans, to make them consistent with later plans; a change in paragraph 38 of the specifications for switches, frogs, crossings; and the withdrawal of Index pages I, II, III and IV, dated March, 1928, and substitution of revised Index, dated March, 1929, pages I, II, III, IV, V and VI, listing plans and specifications, and pages V.

Appendix B—Review of Material Relating to Curve Elevation

The report of the committee under this assignment was divided in two parts: "A critical review of material now appearing in the publications of the association," and "the existing views and practices of the railways." Under the first subject, the committee reported that after careful consideration and review of all material appearing in the publications of the association relative to curve elevation, it was its opinion that all data required by an engineer to decide the proper amount of elevation for the outer rail of curves is contained therein. It made specific reference to the report of the special committee, consisting of F. S. Stevens and G. J. Ray, which appeared in Vol. 15 of the Proceedings, which it stated contained complete information.

Under the second subject the committee quoted the following from the proceedings of the first annual convention in 1900:

"The elevation of curves should be governed primarily by the speed of trains passing over them; but as the speed varies greatly with the same train in different places, and still more with different classes of trains, it necessarily follows that no rule can be laid down for the elevation of any degree of curve at all localities, but each case must be judged by itself."

Having in mind the variances from the equilibrium table which this statement would lead us to expect, the committee corresponded with 53 representative railways to learn their present views and practices

in their respective territories, and under a variety of conditions.

The replies which were received, and which were summarized in the report, indicated that those companies which have tracks given over exclusively to passenger traffic, elevate curves in such tracks, in general, for equilibrium speed. On other roads, where passenger traffic is relatively unimportant and freight traffic heavy, curves are elevated to favor the speed of freight trains, and the speed of passenger trains is reduced to a point where the comfort of passengers is assured. On those roads where both passenger and freight traffic is heavy, the speed for which curves are elevated is necessarily a compromise, the comfort of passengers being the deciding factor.

In conclusion the committee recommended that the data in Appendix B be received as information, and that with the recommendations for changes in the Manual coming under this subject, in Appendix A, this assignment now be considered as completed.

Appendix C—Plans of Switches, Frogs, Crossings, and Slip Switches

The plans presented in this Appendix and revisions to the Manual in Appendix A, coming under this subject were prepared in conference with the Standardization Committee of the Manganese Track Society.

Following a few explanatory remarks with relation to plans previously submitted, and to new plans, the committee offered for adoption the following seven plans of rail-bound manganese steel, bolted rigid, spring rail and solid manganese steel frogs, for heavy rail, and showing uniform tie layouts suitable for any type of guard rail: Plan No. 273, No. 6 frog; Plan No. 274, No. 7 frog; Plan No. 275, No. 8 frog; Plan No. 276, No. 9 frog; Plan No. 277, No. 10 frog; Plan No. 278, No. 11 frog; and Plan No. 279, No. 12 frog. The committee stated that it also has under consideration plans of No. 14, No. 15 and No. 16 rail bound manganese steel and bolted rigid frogs for heavy rails, and plans of No. 18 and No. 20 rail-bound manganese steel frogs for heavy rails, which it expects to present at a later date.

The committee recommended that the four following plans for self-guarded bolted rigid frogs be adopted for inclusion in the Manual: Plan No. 341, No. 6 frog; Plan No. 342, No. 7 frog; Plan No. 343, No. 8 frog; and Plan No. 344, No. 10 frog. In addition, the following written Plan No. 240, specifications for adjustable rail braces, was recommended for adoption:

SPECIFICATIONS FOR ADJUSTABLE RAIL BRACES

(1) Braces shall be so designed that they can be readily applied with properly designed switch or tie plate and tie in position under the rail, and shall have a fit providing a bearing against two of the three rail surfaces (the web, under the head, and top of base) with a clearance between the brace and the edge of the base of rail.

(2) Braces shall be provided with at least ⅜ in. adjustment in increments not greater than ⅛ in. Bearings on the rail and shoulder of plate not to be reduced by adjustment.

(3) Braces to be secured to the plate with at least two heat-treated bolts having a diameter of not less than ⅞ in. provided with spring washers, or other approved detail of equal strength. These bolts to extend either through the tie or through the plate only, in which latter case means shall be provided to prevent either the bolt heads or nuts from turning. These bolts shall be located close to the edge of the base of the stock rail so as to provide a maximum hold down effect.

(4) Braces shall be made of copper-bearing mild steel, malleable iron or cast steel.

The following plans were submitted for information only:

Plan No. 271. No. 4 frogs for heavy rails—rail-bound manganese steel, bolted rigid, and solid manganese steel.

Plan No. 272. No. 5 frogs for heavy rails—rail-bound manganese steel, bolted rigid, and solid manganese steel.

Plan No. 510. Manganese steel one-piece guard rails, 8 ft. 4½ in. length for installation on six ties.

Appendix E—Foundations Under Railway Crossings and Proper Tie Spacing and Timbering Under Railway Crossings

With the adoption last year of Plan 271 covering the design of reinforced concrete and pile crossing foundations, the committee considered the first part of its assignment complete, and therefore, its report this year was solely with respect to tie spacing under crossings. The following plans were presented as information: Nos. 719-A, 719-B and 719-C, tie layouts for crossings covering angles ranging from 8 deg. and 10 min. to 50 deg.; and No. 720, tie layouts for crossings for angles 50 to 90 deg.

The following revised plans were recommended for adoption as recommended practice:

Plan No. 719-A, tie layouts for crossings, angles 8 deg. 10 min. to 14 deg. 15 min.

Personnel of the Committee on Track

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W. G. Arn, asst. ch. engr. Chi. term. imp., I. C., Chicago.
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T. P. Warren, div. engr., C. R. I. & P., Chicago.
J. R. Watt, gen. rdmst., L. & N., Louisville, Ky.

Plan No. 719-B, tie layouts for crossings, angles 14 deg. 15 min. to 25 deg.

Plan No. 719-C, tie layouts for railroad crossings, angles 25 deg. to 50 deg.

Plan No. 719-D, tie layouts for crossings, angles 50 to 90 deg.

Appendix F—Methods of Reducing Rail Wear on Curves

The committee found that about 30 roads have tried various methods of oiling the rail and wheel flanges, and that there seems to be general agreement on the following points:

(1) Oiling, with proper and suitable oil, will considerably reduce side or flange wear on the high rail of curves.

(2) Under ordinary conditions oil can be successfully applied by hand or by machines.

(3) The amount of oil required varies with the amount of traffic carried by the track and physical characteristics of the track, such as curvature, grades, etc.

(4) Other advantages, not readily convertible into tangible items are gained; such as (a) decreased gaging of track on curves with attendant savings in maintenance, labor, ties, etc., (b) decreased wear on engine and car wheel flanges, (c) decreased wear on low rail due to reduced abrasion and partial lubrication of wheel sliding action.

The committee made the following comments in its report for the guidance of those contemplating this method of reducing rail wear:

To secure the best results, oil should be applied to the wheels of every train using the portion of track protected. Hand application of oil should be made on the high rail of curve. Rail where oil is so applied should be slightly flange worn as flanges will not pick up oil from new rail or relayer rail not flange worn.

Oil used should be special oil for this purpose, as ordinary oil, such as black oil, cup grease, etc., does not have proper viscosity to secure satisfactory results.

The distance that the oil is being carried and distributed by flanges can be readily determined and oiling stations placed accordingly.

On descending grades, where many brake applications are made, or where retainers are turned down, heat of the wheels will cause oil to disappear from the wheels and it must be applied frequently to lubricate the rail properly.

Some difficulty has been experienced in securing efficient winter-time oiling, both by hand and machine, especially in northern territory. Special grades of oil are now being made to meet this condition. Attention is also called to the fact that the rail needs oiling to a less extent in winter than in summer.

Several of the larger roads report that they are saving considerable sums in maintenance, due to oiling and are extending the practice to cover larger portions of the road. The committee feels that with proper oiling, uniformly and consistently carried on, the rail on the high side of curves will give considerable increase in life and will effect a saving on roads with sharp curvature.

The committee attached to its report Exhibits A and B, showing the result of oiling on the Norfolk and Western, which give an excellent idea of the difference in wear on the high rail before and after oiling, the amount of traffic carried and the relation of same to the wear. An Exhibit C was also attached, showing the relative cost of oiling by different methods at six locations of each method.

EXHIBIT C—COST OF OILING TO REDUCE RAIL WEAR

(Furnished by Norfolk & Western)

Six Oiling Points Covered by Each Example

(A) Hand oiling, by regular watchman. No labor cost.
Oil 3,833 gal. at 25 cents ..... $ 958.25

(B) Hand oiling, ¼ laborer's time charged to oiling. Rate 38 cents per hour.
Annual labor ..... $ 4,993.20
Oil 3,833 gal. at 25 cents 958.25
$ 5,951.45
Cost per gallon oil applied $1.55

(C) Hand oiling, continuous laborers, no other duties assigned. Rate 38 cents per hour.
Annual labor $19,972.80
Oil 3,833 gal. at 25 cents 958.25
$20,931.05
Cost per gallon oil applied $5.46

(D) Mechanical oiling.
Annual maintenance cost ..... $ 517.80
Labor servicing machines 832.20
Oil 3,288 gal. at 25 cents 822.00
$ 2,172.00
Cost per gallon oil applied $0.66
Saving in oil for machine lubrication as compared with hand oiling: Per year for 6 points, 545 gal.

Appendix G—Cause and Effect of Brine Drippings

Working with a committee of the mechanical division of the A. R. A., the committee sent out a joint questionnaire covering the cause and effect of brine drippings, but this was sent out so late that no detailed report was possible this year.

Appendix H—Plans and Specifications for Track Tools

The committee submitted general specifications and plans, which were developed in conference with the Forged Tool Society, covering clay picks, tamping picks, spike mauls, wrenches, lining bars, rail tongs, tie tongs, spike pullers and rail forks, claw bars, adzes, sledges, mattocks, tamping bars, track chisels and punchers. It also submitted specifications covering hickory handles for track tools, developed in conference with the Hickory Handle Association, and a plan covering a modified type of track gage. The committee reported that further study will be given the subject of track tools in an endeavor to work up simplified standards covering track levels, ballast forks, track shovels, axes, scythes and other tools used in the maintenance of way department.

Discussion

[The report was presented by Chairman J. V. Neubert (N. Y. C.) with Vice-president G. D. Brooke (C. & O.) in the chair, and the discussion was opened with a review of the proposed revisions of the manual by Subcommittee Chairman C. W. Breed (C. B. & Q.), *who moved that the revision of the formula for curve elevation be adopted.*]

B. R. Leffler (N. Y. C.): There is considerable difference of viewpoint as shown in the various tables by the different roads. Some of the roads use the present A. R. E. A. table. It seems to me that this question of curve elevation is one so dependent on conditions of traffic and conditions of the rolling equipment, that it is unwise to give a table or a formula in the Manual. It would be more reasonable to omit the table from the Manual entirely, and omit any reference to a mathematical formula, naming instead a few leading principles that should govern rail elevation. Having a formula or a table of precise calculations gives a false aspect and will be used in a way that is detrimental to good railroad practice.

Mr. Breed: The formula gives the equilibrium speeds for elevating. It is simply a guide and should be so used.

[*The motion was put to a vote and carried.* The other revisions of the Manual on curve elevation were then presented and adopted without discussion, following which Subcommittee Chairman G. M. Wakefield (B. & O.) was called upon to present the report on plans.]

Mr. Wakefield: Each year for several years this committee has presented a number of plans as information. These have covered details and specifications for track work. With a view toward making this series of plans more complete, the committee presents further plans this year, these plans having been prepared in collaboration with the Standardization committee of the Manganese Track Society.

[The revisions on the plans for frogs were adopted for inclusion in the Manual without comment and the plans for flange frogs were recommended for adoption.]

Past-President J. L. Campbell (N. W. P.): I want to ask a question in connection with the first motion. Is this the first time these plans have been submitted on the floor of the convention?

Chairman Neubert: The plans have been before the convention at least once, if not more times.

[*The motion to adopt the plans was put to a vote and carried.* Then followed the adoption in order of the specifications for adjustable rail braces and other recommendations in connection with Appendix A, including the withdrawal from the Manual of the chart on train speeds on curves. This was followed by the adoption without comment of the Appendices D and E. The information in Appendix F on Oiling Flanges was then offered for adoption as information by Subcommittee Chairman C. M. McVay (N. F. & G.).]

Mr. McVay: The report was developed by collaboration of the subcommittee of the Rail committee and about all that we have been able to find so far is the practice of applying oil to wheel flanges to reduce rail wear. This practice is comparatively recent. It was begun about four or five years ago and has not as yet become general on the different roads, but it has been gaining rapidly and many roads are now adopting the practice. The oil was first applied by hand. After that some machines were developed and oil is now being applied on quite a number of roads in several different ways.

[The report on brine drippings was presented by Subcommittee Chairman W. G. Arn (I. C.).]

Mr. Arn: The subcommittee on Cause and Effect of Brine Drippings found that there was a similar committee in the Mechanical Division, and it was therefore arranged to work with that committee. A joint questionnaire on this subject was prepared and sent to all the railroads, but at the time the bulletin went to press no information had been received; since that time, however, many replies have been received.

There is quite a difference in the extent of salting cars on the different railroads. The cases in which salt is used with ice on the lading in this type of car are so few as to be negligible. This type of refrigerator car does not have brine-retaining devices, and it is not practicable to equip these cars with brine-retaining devices as they are now constructed.

With reference to the meat cars, 5 roads report frankly that no attempt is made to keep the brine-retaining apparatus in working condition; 17 roads state that inspections are made, and on some of these roads the defects are reported to the owners, but the cars are allowed to go forward; 12 roads report that they make minor repairs; and one originating line reports that it returns to the owner, at point of origin, cars on which defects are found in the brine-retaining apparatus. The cars found to be defective vary on different roads from none to 61 per cent, and 10 of the roads report finding leakages from other parts of the car than the brine-retaining devices.

Suggestions for improving conditions include: Closer inspection, maintaining retaining apparatus in better condition, installing a better type of valve, improving the design of the brine-retaining apparatus, arranging the drip on the fruit and vegetable cars to clear the track and using a mechanical or chemical refrigerant.

The question of damage to exposed parts of the railroad is estimated on different roads as follows: Steel bridges—up to 60 per cent of service life; rail—up to 50 per cent of service life; tie plates and track fastenings—up to 75 per cent of service life; signal apparatus—up to 75 per cent of service life, and car trucks—up to 50 per cent. One railroad reported damage to concrete platforms.

An estimate of the money damage was furnished by a few roads. Those furnishing figures estimated the damage to bridges, tracks and signals at figures varying from nothing up to $200 per mile, and from nothing to a total of $500,000 per system. One company estimates the damage to car trucks at $5 per car per year.

The following are the most important suggestions for protection against deterioration of track: Oil the track with Texaco No. 45 oil; oil with ordinary crude oil, use copper-bearing tie plates, spikes and angle bars; paint track fastenings with No-ox-id.

For bridges, paint the members exposed to brine drippings often enough to give them protection; use Armco brine troughs; cover steel bridge members with sheet lead and prepared roofing; and use creosoted bearing blocks.

The various painting materials recommended are: No-ox-id paint, asphaltic paint, Texaco No. 45 oil, crude oil, Toch's R. I. W. paint, bridge cement, and Gilso cement.

For signals use copper-weld bond wires or galvanized and coppered metals and paint exposed parts with Texaco Crater compound, No-ox-id paint, graphite paint or crude oil.

Paint car trucks with roof cement paint, and amend 1922 Mechanical Division rules for testing under full head of water and stencil car with date of test.

The following are the most important suggestions for eliminating deterioration:

Improve the brine tanks and valves on meat cars to make them more effective, use copper-bearing steel in bridge structures and in track material, put concrete decks on steel bridges, use a refrigerant which does not drip a corrosive liquid, put brine-retainers on fruit and vegetable cars, use only meat cars for shipments requiring salt, use larger brine tanks, use copper-bearing steel for making the brine tanks.

The railroads handled 1,305,659 refrigerator cars in 1927, or 3.7 per cent of the total cars handled. The proportion of refrigerator cars handled in 1927 was 0.1 per cent in excess of the proportion handled in each of the years 1924, 1925 and 1926.

W. H. Courtenay (L. & N.): This subject has been before this association for years and nothing has been done about it. I think there are a number of roads here that have tried almost every conceivable rust preventative that has been suggested, proprietary or otherwise, and still there is nothing being done. The damage is so enormous that it is impracticable to determine the amount.

This association should use every power to stop the shipment of brine over the railroads without satisfactory brine-retainers from which the brine may be emptied at stated points. To give further consideration to the matter is not enough; we should take some action that will abate the trouble.

[The report was received as information. Then Subcommittee Chairman G. M. Strachan (A. T. & S. F.) presented the report on Plans for Track Tools which was received as information without comment and the committee was then excused.]

Report of Committee on Wood Preservation

Supplemental definitions submitted complete list of all terms used by treating industry

F. C. Shepherd
Chairman

THE following subjects were covered in the report of the committee:

(1) Revision of Manual (Appendix A).

(2) Definitions used in wood preservation (Appendix B).

(3) Service test records for treated ties (Appendix C).

(4) Piling used for marine construction (Appendix D).

(5) Effect of preservative treatment by the use of: (a) Creosote and petroleum (Appendix E). (b) Zinc chloride and petroleum (Appendix F).

(6) Prepare specifications for treatment of air-seasoned douglas fir (Appendix G).

The committee recommended that the revision suggested in Appendix A be adapted for inclusion in the Manual, and that the reports given in Appendices B. C. D, E. F and G be received as information.

Appendix A—Revision of Manual

Only one revision for the Manual was suggested by the committee and that dealt with an improved form of shield for use in the analysis of creosote. The committee reported that the proposed shield is much more convenient than the old type, and in no way affects the results of the analysis. It already has been adopted by the American Wood Preservers' Association and the American Society for Testing Materials. The suggested revision of the Manual is as follows:

Eliminate paragraph (c) at the bottom of page 110, top of page 111, Bulletin 288, Supplement to the Manual, and substitute the following:

"A galvanized-iron shield lined with ⅛-in. asbestos of the form and dimensions shown in Fig. 10 shall be used to protect the flask from air currents and to prevent radiation. The cover (top) shall be of transite board made in two parts, or it may be of galvanized iron lined with ⅛-in. asbestos."

The committee also submitted new drawings of the shield and the testing apparatus assembled, and recommended that they be substituted for the two drawings already appearing in the Manual.

Appendix B—Definitions Used in Wood Preservation

Last year the committee presented a list of definitions of the more important terms used in wood preservation, and this year prepared an additional list of definitions which, when combined with the list previously submitted, includes practically all the terms ordinarily used in wood preservation. A number of these definitions are given below:

Absorption, Volmetric.—Ratio of the volume of preservative solution absorbed to the total volume of the timber.

Allerdyce Process.—A two movement treating process involving the injection of a solution of zinc chloride followed by creosote. (Proposed by R. L. Allerdyce.)

Anthracene.—A crystalline salt derived from coal tar. Melting point 216.5 deg. C. Boiling point 360 deg. C.

Anthracene Oil.—A distillate from coal tar, distilling between 270 deg. and 400 deg. C. Sometimes called "green oil."

Bethell Process.—Pressure treatment with creosote consisting of the following steps: Preliminary vacuum; injection of creosote; final vacuum. Invented by John Bethell in 1838. Now generally known as the "full cell" process.

Boulton Process.—Process for removing moisture from wood by boiling it in cresote under a vacuum. (Invented by S. B. Boulton in 1879.)

Burnett Process.—Treating wood with a solution of zinc chloride. (Patented by William Burnett in 1838.)

Card Process.—Pressure treatment with a mixture of oil and a water solution of a salt, usually creosote and zinc chloride, the mixture being kept uniform by means of a rotary pump. (Patented by J. B. Card in 1906.)

Copper Sulphate.—A salt formed by the action of sulphuric acid upon copper. Used to some extent as a wood preservative.

Corrosive Sublimate.—Mercuric chloride.

Displacement.—In wood preserving, the volume of wood in a charge as determined by measuring the volume of liquid displaced by the wood in the cylinder.

Flask, Distilling.—Glass flask with a side neck, used in making the distillation test.

Flask, Extraction.—Glass vessel for containing the solvent in making the test to determine the "Insoluble in Benzol."

Free Carbon.—Term frequently and improperly used instead of "Matter insoluble in Benzol."

Humidity, Relative.—The amount of moisture in the air expressed as a percentage of the maximum amount that the air could hold at the same temperature and pressure.

Hydrometer.—An instrument used for determining the specific gravity of liquids.

Hygrometer.—An instrument used for measuring the amount of moisture in the air.

Kick-Back.—Amount of preservative forced out of the cylinder when the pressure is released.

Kiln-Dried.—Wood from which the moisture has been removed in kilns by means of hot air.

Kyanize.—Treating wood by steeping in a solution of mercuric chloride. (Invented by John H. Kyan in 1832).

Leach.—To dissolve out by percolation. Refers particularly to the removal of soluble preservatives from wood in contact with wet soil or water.

Lowry Process.—An empty cell process for treating wood with creosote in which there is injected, without a preliminary vacuum, an amount of creosote in excess of the required final retention, this excess then being removed by a quick high vacuum. (Invented by C. B. Lowry in 1906.)

Mercuric Chloride.—A compound of mercury and chlorine; bichloride of mercury; corrosive sublimate.

Moisture, Hygroscopic.—In wood, water which is absorbed by the cell walls as distinguished from "free water" in the cell cavities.

Mold (Mould).—Any of the lower fungi. In general these fungi form loose wefted mycelium on the surface of organic material which frequently becomes covered by a powdery mass of spores.

Mycelium.—The mass of thread-like elements forming the vegetative portion of a fungas.

Napthalene.—A crystalline salt derived from coal tar. Melting point 79 deg. C. Boiling point 218 deg. C.

Oil, Water Free.—Oil containing no water; dry oil.

Oil, Wet.—Oil containing more water than allowed by specifications.

Permeability.—The degree to which wood permits the injection of preservatives.

Pressure Period.—That portion of a treating operation during which the preservative is under pressure.

Pyknometer.—A calibrated bottle used for measuring the volume and weight of a liquid in determining its specific gravity.

Refractory.—Offering resistance to the entrance of preservatives; difficult to treat.

Residue.—That portion of an oil or tar which remains in the flask on completion of the distillation test.

Residue, Coke.—The material remaining in the crusible on completion of the coke test.

Rueping Process.—An empty cell process for treating with creosote in which the following sequence is employed: Compressed air; cylinder filled without reducing pressure; pressure held until required absorption is obtained; final vacuum. (Patented by Max Rueping in 1902.)

Sap Stain.—Discoloration of sapwood by certain fungi which live upon the materials in the sapwood cells. Does not seriously impair the strength of timber.

Sodium Fluoride.—Sodium salt of hydrofluoric acid.

Solution.—A liquid combination of liquid and non-liquid substance or of two or more liquids, as a salt and water or coal tar and creosote.

Specific Gravity.—The ratio of the weight of a substance to the weight of an equal volume of water under the same conditions.

Spores.—The reproductive bodies of fungi corresponding to the seeds of higher orders of plants.

Tar Acids.—Compounds of carbon, hydrogen and oxygen found in various tars, intermediate in character between acids and alcohols. Those most common in coal tar are carbolic acid and cresylic acid.

Test, Distillation.—A test used to determine the proportion of oils and tars which distill between certain temperatures.

Test, Float.—A test used to determine the viscosity of bituminous materials, applied to creosote coal tar solution as giving an indication of the proportion of tar in solution.

Viscosimeter.—An instrument used to measure the viscosity of liquids.

Viscosity.—The resistance of a liquid to free flow.

Wellhouse Process.—A pressure process in which wood is treated with a water solution of zinc chloride and glue followed by a solution of tannin. (Patented by Wm. Wellhouse in 1879.) Also called Zinc-tannin process.

Zone Ratio.—Ratio of the volume of a zone to the entire volume of the liquid being sampled.

Zone Sample.—A sample taken from any desired depth or zone in a tank or, more particularly, a tank car.

Appendix C—Service Test Records for Treated Ties

In the committee's report, the table of tie renewals per mile on various roads was brought up to include renewals in 1927. This diagram shows a comparison of annual renewals, five-year averages, and cumulative averages.

The committee also submitted additional records from the Forest Products Laboratory, supplementing the complete table presented in the 1926 Proceedings. In 1925 the committee presented a full report of the fence post test on the Atchison, Topeka, & Santa Fe at Cleveland, Texas. Some posts were added to this test in 1926, and an inspection was made in October, 1927.

The records taken at this inspection indicate the value of pressure treatment as compared with brush and open-tank treatments, and the value of standard preservatives compared with various experimental and proprietary solutions.

Other special reports presented by the committee were four covering special test tracks on the Baltimore & Ohio, the Chicago, Burlington & Quincy, the Illinois Central, and the Northern Pacific.

Appendix D—Piling Used for Marine Construction

The report of the committee was based on the recent inspections of the long time test pieces prepared by the Chemical Warfare Service, some of its own members, the Army, Navy and other co-operators. The materials under test were classified mainly under three heads: Supposedly immune timber and mechanical protection; Chemical Warfare Service tests; and tests made by the committee itself.

The report of the committee's experiments followed an inspection of test specimens impregnated with creosote as described in previous reports. Following these reports, and the usual reports on test piles, the committee gave the following summary of its findings:

Summary

The tests of tropical timbers are still inconclusive so far as some species are concerned, but as is the case with timber treated with preservatives it appears that it is much more difficult to protect against limnoria than teredo.

Turpentine wood still shows a good record except for one specimen in Charleston, S. C. The Panama canal organization is arranging for exhaustive tests of this timber.

Some of the Chemical Warfare Service specimens are showing signs of failure but those specimens which the members of the committee have been able to inspect appear to be poorly treated.

The San Francisco tests of various cresotes are still inconclusive because of light attack so far.

The "Long Wharf" piles continue to resist attack after 38 years' service.

The committee reported that it has distributed a series of new test pieces treated to refusal with a 6 per cent Ac-Zol solution to the stations where the Chemical Warfare Service specimens are located. These tests pieces were treated and distributed by the courtesy of the Norfolk Cresoting Co.

It recommended in conclusion; that its work be continued with no change of plan, and that on account of the increasing activity of termites, a study of methods of protection against this menace be either assigned to it, or that a new committee be organized for its study.

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W. G. Atwood, cons. engr., 39 Broadway, New York.
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Z. M. Briggs, asst. engr., Penna., Pittsburgh, Pa.
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E. A. Craft, engr. m. w., S. P., Houston, Texas.
G. M. Davidson, indust. engr., C. & N. W., Chicago.
H. R. Duncan, supt. timber preserv. C. B. & Q., Galesburg, Ill.
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Andrew Gibson, supt., timber preserv. N. P., Brainerd, Minn.
W. R. Goodwin, engr, timber preserv., M. St. P. & S. S. M., Minneapolis, Minn.
W. H. Kirkbride, W. H., engr. m. w. and str., S. P., San Francisco, Cal.
C. F. Ford, supvr. tie and timber dept., C. R. I. & P., Chicago. *Vice-chairman*
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T. H. Strate, engr. of trk. elev., C. M. St. P. & P., Chicago.
C. Marshall Taylor, vice-pres., Curtin-Howe Corp., New York.
Dr. Herman von Schrenk, cons. timber engr., St. Louis, Mo.
J. H. Waterman, rep., Curtin-Howe Corp., Galesburg, Ill.
Galen Wood, cons. chem. eng., Philadelphia, Pa.

This part of the report was followed by the eighth report on "Deterioration of Structures in Sea Water," prepared by the "Sea Action Committee" of the Institute of Civil Engineers.

Appendix E—Preservative Treatment by Creosote and Petroleum

In view of the fact that there have been no radical changes in the ties under observation in the test tracks, the committee felt that no information other than that already submitted could be presented this year, and, therefore, suggested that the subject be continued for further investigation.

Appendix F—Preservative Treatment by Zinc Chloride and Petroleum

The report of the committee under this assignment was similar to that given under Appendix E, and it was suggested that the subject be reassigned for further investigation and report.

Appendix G—Specifications for Treatment of Air-Seasoned Douglas Fir

The report of this committee is in part as follows:

During the year the committee has made a study of creosoted Douglas fir piling and timbers which have been in service 10 to 32 years. Forty-two bridges containing creosoted Douglas fir were inspected on the Burlington, Rock Island, Southern Pacific and Santa Fe. It has been the aim of all methods of pressure treatment of wood to secure the greatest depth of penetration of preservative possible, and inasmuch as there is a great variation in depth of penetration in individual pieces of Douglas fir, even after having been treated to refusal by best methods known, it was the object of this study to see how timbers of shallow penetration compared as to length of service with timbers of much deeper penetration of preservative. A large number of borings with increment auger was made, the cores showing penetration ranging from ⅛ in. to 5 in.

On the Louisiana division of the Rock Island, there are a number of open-deck pile trestles constructed in 1914. These trestles are entirely of creosoted pine with the exception of six stringers in each panel which are of creosoted Douglas fir, size 8 by 16 by 30. Two additional stringers in each panel are of creosoted pine, which were added later. The Douglas fir stringers are of both the slow growth and wide ring Douglas fir. All creosoted timber in these bridges was found to be in excellent condition after 14 years' service and at the time of inspection, the committee could see no difference in the relative condition of pine and fir or slow growth and wide ring fir. The fir stringers received an average of 7½ lb. per cu. ft. Penetration of creosote in the fir stringers ranged from ¼ in. to 2 in.

In contrast to the excellent condition of the treated Douglas fir stringers after 14 years' service, it is interesting to know that the trestles which were replaced by the present structures were of untreated timber and the stringers were of untreated Douglas fir. These bridges were built in 1906, the committee was informed, and the untreated stringers were considerably decayed at bolt holes and points of contact with other timbers. They were unfit for further service at the time the untreated structures were replaced by the present creosoted structures, having given only an eight-year life.

On the Southern Pacific in California, it was the good fortune of the committee to have the opportunity of examining trestles 27 to 32 years old, constructed of treated Douglas fir.

It should be stated that the treatment given these timbers was known as the "Boiling Process" and, in general, the timber was green at the time of treatment. This treatment should be compared with the treatment recommended by the committee in Volume 27 of the Proceedings of the Association. This latter treatment is known as the Boulton or Boiling under vacuum treatment. Temperatures are somewhat lower in the treatment recommended than was the practice in 1895 to 1898.

It should be noted that all framing was done prior to treatment which, without doubt, contributed materially to the excellent record which has been made by these bridges. It has been observed by the committee that creosoted timbers coming out of bridges, which have been dismantled, in many cases show one end of the timber badly decayed, the opposite end sound, the decay apparently being due to the fact that one end of the stick was trimmed when it was placed in the structure. Other timbers show failure due to framing of the treated wood at time of construction and there is considerable decay adjacent to bolt holes. The committee takes this opportunity to call attention to the importance of doing all trimming and framing possible before treatment.

Comparing the life of untreated Douglas fir bridge timbers with the excellent record made by the treated fir structures, the committee was advised that untreated Douglas fir decks in the same vicinity as the creosoted structures inspected gave a service life of 12 to 14 years. The difference between this figure and the records on the Louisiana division of the Rock Island is doubtless explained by the very different climatic conditions in the two locations.

Practically every pile or timber bored in these creosoted fir structures was found to be in sound condition throughout, those of shallow penetration being in as good condition as those of deep penetration, so far as those making the inspection could ascertain. All timbers examined had been given very nearly the same treatment and without doubt the variation in penetration is due to the character of the timber in individual sticks and not to variation in treatment.

Discussion

[Chairman F. C. Shepherd (B. & M.) presented the report and introduced Dr. Hermann von Schrenk (cons. timber engr.), who submitted the matter in Appendix A.]

Dr. von Schrenk: The subcommittee on Revision of the Manual has one recommendation concerning the elimination of paragraph (c) in the supplement to the Manual. New drawings are submitted on the shield and apparatus. This recommendation will bring our standard method of analysis in line with the work which has been done on a co-operative basis between the committees of the American Railway Engineering Association, the American Wood-Preservers' Association, and the American Society for Testing Materials, and we trust this will be the last for some time. *I move that the recommended change be approved for printing in the Manual.*

[*The motion was carried.*]

Chairman Shepherd: The report on Definitions Used in Wood Preservation, which is presented as information, includes the list presented at the last meeting. The two lists combined will be presented as a final report later.

The report on Service Test Records for Treated Ties includes a table of tie renewals, additional records from the Forest Products Laboratory, a description of tests on fence posts on the Santa Fe, and a report of special test tracks on four roads. This is presented as information.

The report on Piling Used for Marine Construction is shown in Appendix D. This report, submitted as information, is based on recent inspections of the long-time test pieces.

The reports on Effect of Preservative Treatment by the Use of Creosote and Petroleum, Appendix E, and the Use of Zinc Chloride and Petroleum, Appendix F, simply state that the committee has no information to present this year, but requests that the subjects be continued.

The report on Specifications for the Treatment of Air-Seasoned Douglas Fir, Appendix G, is presented after an exhaustive inspection by the committee of a large number of bridges containing creosoted Douglas fir. This report is offered as information.

[This concluded the report and the committee was excused with the thanks of the association.]

Report of Committee on Grade Crossings

Committee discussed various phases of grade crossing protection, together with the allied problem of elimination

F. J. Stimson
Chairman

THE committee reported on the following subjects:

(1) Revision of Manual (Appendix A).

(2) Apportioning the cost of highway improvements adjacent to railway rights-of-way:

(a) Within incorporated limits of municipalities.

(b) Without incorporated limits of municipalities.

(3) The comparative merits of various types of grade crossing protection collaborating with the Committee on Signals and Interlocking (Appendix B).

(4) Study of excessive number of highway grade crossings of railways with methods for their removal.

(5) The economic aspects of grade crossing protection in lieu of grade separation (Appendix C).

(6) The use of center columns for highway grade separations (Appendix D).

(7) Various types and locations of approach and warning signs for grade crossings, also the practices in the several states and federal requirements, with a view of securing uniformity of practice and standards (Appendix B).

(8) Laws and regulations affecting the apportionment of Federal aid and the proper form and character of division of costs of separation of grades as between the railway, state, county, municipal or other corporations.

(9) Evolve a formula which will develop and evaluate the relative benefits to the public and railways from:

(a) Grade crossing protection,

(b) Elimination of grade crossings,

(c) Reduction of traffic on highway grade crossings (Appendix E).

The committee recommended that the highway crossing sign as shown in Appendix A, as well as the conclusions in Appendices B and E be approved for inclusion in the Manual, and that the reports in Appendices C and D be received as information. It deferred further active work on subjects (2), (4) and (8) in view of the action taken by the association at the 1928 convention.

Appendix A—Revision of Manual

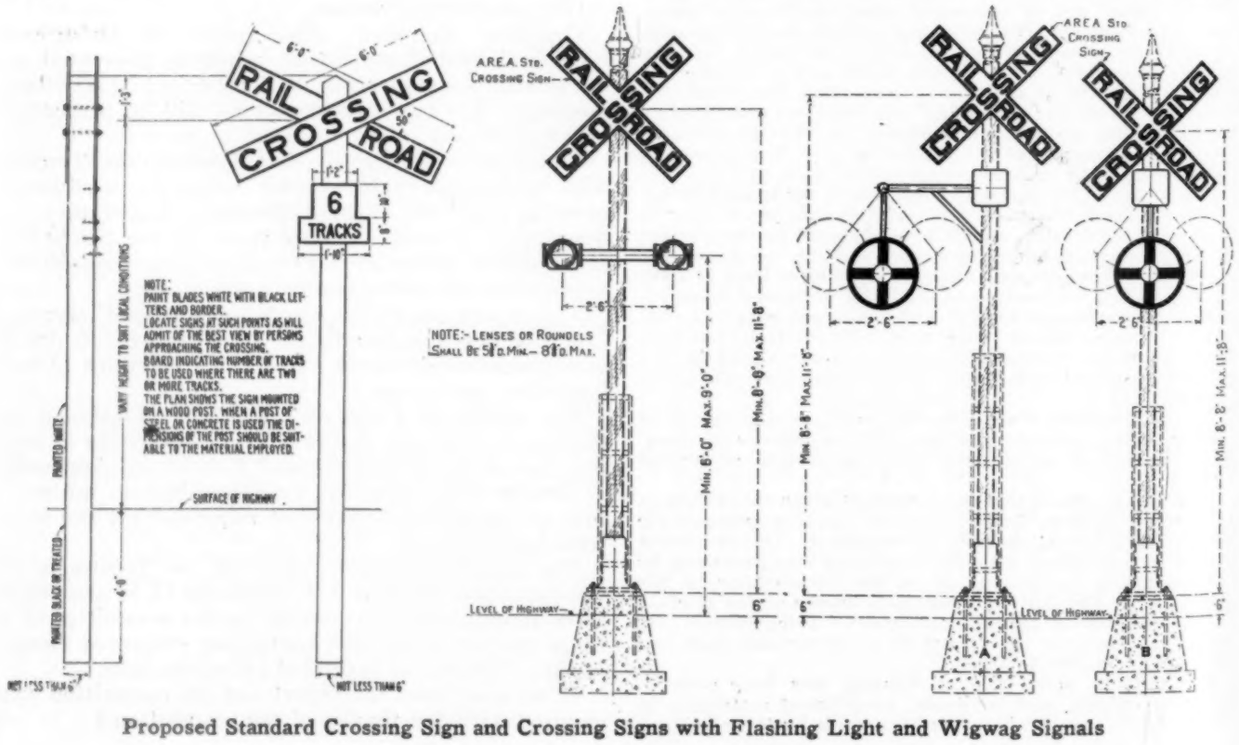
Following the action of the 1928 convention, the committee gave further consideration to the highway crossing sign, particularly with reference to the use of an auxiliary sign indicating the number of tracks to be crossed, and again submitted the plan to the membership for letter ballot. The result of this ballot was as follows:

For highway crossing sign with indication showing number of tracks to be crossed, 642 votes.

For highway crossing sign without indication showing number of tracks to be crossed, 309 votes.

Against proposed highway crossing sign, 72 votes.

The committee, therefore, recommended the adoption



Proposed Standard Crossing Sign and Crossing Signs with Flashing Light and Wigwag Signals

of the sign as shown for publication in the Manual as recommended practice.

In this connection, the committee was advised that the Traffic Committee of the American Engineering Council, which was appointed at the request of the National Conference on Street and Highway Safety, had adopted the following specifications for sign at crossing of highways with railways:

"1. All railroad crossing signs shall be made of two arms mounted across each other in inclined positions to form a crossbuck;

"2. All signs shall be placed not more than 15 feet from the railroad crossing;

"3. Colors, black letters on white background."

It is expected that these specifications will be adopted at the next meeting of the National Conference.

Appendix B—Comparative Merits of Various Types of Protection

On this subject, the committee collaborated with the Committee on Signals and Interlocking and recommended that uniform protective signs, signals and methods to avoid the great diversity that now exists. Statistics were presented showing the number of grade crossings protected by various methods and also the grade crossing accidents at crossings equipped with each method, these figures being for the years 1925 to 1927, inclusive. A tabulation was also presented showing the requirements by the different states as to highway stop signs at specially designated crossings.

The committee submitted its recommendations in the following conclusions:

1. We recommend that the flashlight, Fig. 1, or wigwag signal, Fig. 2, be adopted and placed in the Manual as recommended practice for installation at busy crossings and for replacing gates and watchmen.

2. We recommended that the advance warning sign as shown by Fig. 3 be approved as recommended practice and placed in the Manual.

3. We recommend that wherever wigwag or flashlight signals are used, two shall be used at each crossing, one on each side of the track, and that in cities and towns, when the street is of sufficient width, the signals shall be located in the center of the street. Recommended practice is shown in Fig. 4 and Fig. 5.

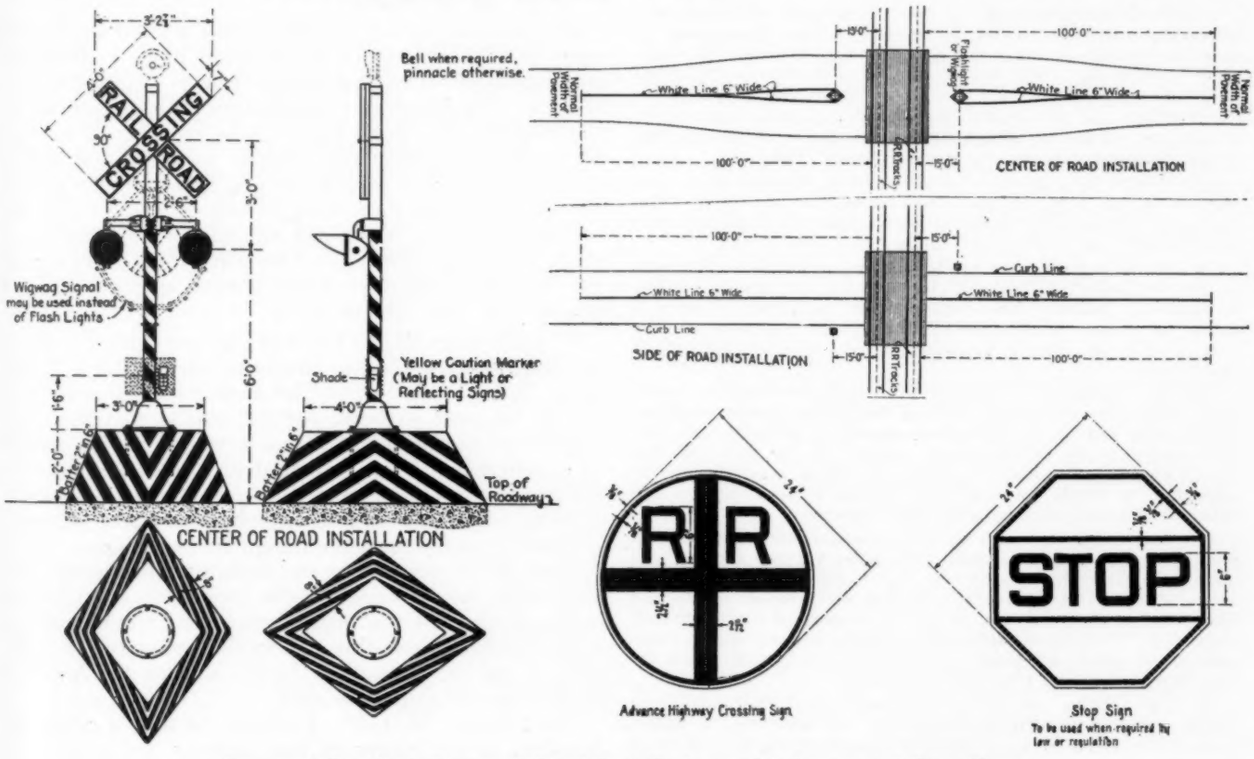
Appendix C—Grade Crossing Protection in Lieu of Crossing Separation

The committee has secured information for use in formulating a report but requires further study to reduce the data to a unit basis. The results of the study thus far is shown in the appended table.

Types of Protection	No. of Roads Reporting	Depreciation	Interest 5½ Per Cent	Annual Mtce. and Operation	Total Annual Cost	Annual Cost Capitalized at 5½ Per Cent
Watchmen	8	$ 8.24	$ 9.54	$2,951.23	$2,869.03	$52,000
Gates	11	86.59	95.10	3,069.65	3,251.35	59,000
Flash Lights	10	93.09	105.27	256.30	454.66	8,300
Wig wags	7	90.32	106.96	245.20	442.58	8,000
Spl. Fixed Signs	4	1.71	1.53	9.44	12.68	250

Appendix D—Center Columns for Highway Grade Separations

Information is being secured from all the states and provinces, as well as all cities of 200,000 population, or over, in the United States and Canada, regarding the laws, ordinances and other requirements governing the use of center columns in highway grade crossing elimination work. The information received to date is incomplete and the committee will continue its studies during 1929.



Proposed Standard Center of Road Installation and Advance and Stop Signs

Appendix E—Formula to Evaluate Benefits from Various Methods of Treatment

The committee presented a discussion of this subject from the standpoint of the responsibilities of both the railways and the users of the highways and while it found the development of a formula difficult, if not impossible, it stated that justice and sound economics demand that both share in the costs, and summed up

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the results of its studies in the following conclusions:

1. In the determination of the relative benefits to the public and railroads from (a) protection of highway grade crossings, (b) elimination of highway grade crossings and (c) reduction of traffic on highway grade crossings, consideration should be given to the following general principles:

(a) Creation of new grade crossings should be avoided.

(b) In the construction and improvement of highways and railroads, provision should be made for the elimination of existing highway grade crossings, including crossings of local roads where the road traffic can be diverted to the main highways.

(c) Plans and agreements for highway crossing separations should provide for the abandonment and closing of the existing grade crossings carrying the same highway traffic.

(d) Where the expense of grade crossing elimination or separation is not justified, protection should be provided. The character of protection should depend upon local conditions and the character and volume of traffic.

(e) Increasing need for grade crossing protection is brought about principally by change in character and increase in volume of highway traffic. The benefit from such protection will accrue in greater proportion to users of the highway and the cost should be shared accordingly by state and municipal authorities.

(f) The elimination or protection of highway grade crossings is of such importance, and involves the public safety to such an extent, that primary consideration should be given to such improvements in the allocation of capital by the railroads for safety measures designed to protect the public, and also in the allocation of funds made available by the Federal aid act and other legislation for highway improvements.

(g) The order in which grade crossing elimination projects should be undertaken depends upon many varying factors, and should be fixed by a study of the local conditions at each crossing, care being taken to see that the greatest safety and expedition in the movement of traffic are secured for the money expended. Primary consideration should be given to the elimination of grade crossings at which extra hazard exists by reason of traffic and physical conditions.

2. The relative benefits to the public and railroads from grade crossing protection, elimination, or reduction of traffic, cannot be evaluated by a formula, but must be arrived at in the light of reasoned judgment, having in view all the conditions and factors affecting the particular crossing. Among the elements to be considered are:

(a) Physical conditions:
  1. Alinement.
  2. Grades.
  3. Visibility.
  4. Drainage.
  5. Character and cost of highway and railroad construction.

(b) Railroad traffic:
  1. Number and speed of trains.

(c) Highway traffic:
  1. Number of automobiles.
  2. Number of trucks.
  3. Number of horse drawn vehicles.
  4. Relative proportion of local and through highway traffic.

(d) Federal and state laws and regulations.

3. The committee desires to emphasize the necessity for sincere co-operation between railway and highway officials in the consideration of grade crossing problems.

Discussion

[In the absence of Chairman F. J. Stimson (Penna.), the report was presented by Vice-Chairman Frank Ringer (M.-K.-T.), who called upon Subcommittee Chairman Maro Johnson (I. C.) to review the proposed revisions for the Manual.]

Mr. Johnson: Since this report was printed additional votes have been received on the letter ballot concerning crossing signs. The total number now is 1,102, of which 670 favor the highway crossing sign with an indication showing the number of tracks to be crossed; 329 favor the highway crossing sign without an indication showing the number of tracks; 89 are against the highway crossing sign, and there were 14 ballots which could not be interpreted or were not signed. This committee, therefore recommends the adoption of the drawing of the sign for publication in the Manual as recommended practice. *I move this adoption.*

G. D. Brooke (C. & O.): The sign provided for flashing-light signals has one character of crossbuck. The plain sign has an arm. The same type of crossbuck should be used on both, for the reason that this sign appears to the driver of a motor vehicle in the nature of a conventional sign rather than a message given by the wording. It is impossible for drivers of rapidly moving vehicles to read the lettering correctly. It seems desirable to have the same design for both signs.

The note referring to the flashing-light signal indicates that the lettering on the crossbuck is to be the same as that for the plain sign. That would make it impracticable to use this sign in the center of the highway or to put it as close to the side of the highway as if a shorter sign were used.

J. C. Mock (M. C.): This sign as shown cannot be installed in the center of the highway and permit the same clearance allowed with the present shorter crossbuck signs. That is also true as to the location on a curve. If possible, we would prefer the older type sign.

Vice-Chairman Ringer: As to the length of the sign; many states specify the dimensions of the letters on the crossbuck sign and a longer board than is used on the flashing-light type of signal. It would be difficult to reconcile the two.

Mr. Brooke: If that situation did not exist, what would be the committee's view of the matter?

Vice-Chairman Ringer: The committee has not considered that condition, and under the circumstances, I do not believe it should come up here. Of course, it would be desirable to have uniformity in the signs.

Mr. Hadley Baldwin (C. C. C. & St. L.): This sign ought to be adopted, independently of considerations for the smaller crossbuck sign that goes on the flashing-

light signals. A great majority of the crossings in the country are equipped with only a sign of this character which identifies at a distance the location of a railroad crossing more effectively than anything that has been conceived, except wayside signs along the highway.

The crossbuck sign on the flashing-light signal has a supplementary rather than a major value. The flasher signal is conspicuous, and the crossbuck helps, as a secondary proposition, to identify it. But these crossbuck signs, that are intended for use all over the country, ought to be standard. This form of sign should be adopted.

R. H. Ford (C. R. I. & P.): I endorse all that the previous speaker said. There is a misapprehension on the part of one or two of the speakers with respect to the sign and its purpose. There is a great need of standardization with respect to a crossing sign. I think one of the main advantages of adopting the report is that uniform legislation can be established throughout this country. As it stands today, a number of states have various types of signs.

W. F. McDonald (C. M. St. P. & P.): If I understand the situation correctly, the question involved here is not that of the crossbuck sign, but whether or not a supplementary sign shall be placed on it indicating the number of tracks. That question came up the last convention and was referred back to the committee because the convention could not agree on the question of whether we should put this supplementary sign there. The committee has taken a vote and the majority have decided in favor of affixing this supplementary sign.

The actual crossbuck sign as it exists here has been a standard of this association for many years.

Mr. Mock: This sign will not be used generally with flashing-light signals. We formerly used this type of sign and found it necessary to change to 90 deg. instead of 55 deg.

President Faucette: A definite matter is before you in regard to putting on the plate indicating the number of tracks. The crossbuck sign has an angle of 50 deg. between the blades.

Vice-Chairman Ringer: The committee has understood that it is governed in this matter by the letter ballot which was in favor of the adoption of this sign as submitted; and in view of the instructions of the association at the last convention, the committee is not at liberty to make any further changes and presents the sign for adoption as a result of the letter ballot.

President Faucette: It has been moved that the sign as presented be adopted as a practice of this association.

[*The motion was carried.*]

Vice-Chairman Ringer: Subjects 2 and 7 will be presented by Bernard Blum (N. P.), chairman of the subcommittee.

Mr. Blum: We have three recommendations to present.

1. We recommend that the flashlight, Fig. 1, or wigwag signal, Fig. 2, be adopted and placed in the Manual as recommended practice for installation at busy crossings and for replacing gates and watchmen.

Arthur Ridgway (D. & R. G. W.): The color of the signal should be designated on the drawing.

Mr. Blum: There is no objection to indicating the color on the drawing.

[*A motion to accept recommendation No. 1 was carried.*]

Mr. Blum: *I move that the advance warning sign be approved as recommended practice and placed in the Manual.*

[*The motion was carried.*]

Mr. Blum: We recommend, wherever wigwag or flashing-light signals are used, that two shall be used at each crossing, one on each side of the track, and that in cities and towns, when the street is of sufficient width, the signals shall be located in the center of the street.

I move that this be approved and included in the Manual as recommended practice.

A. H. Rudd (Penna.): I should like to ask the committee if it is willing to omit the words, "and that in cities and towns, when the street is of sufficient width, the signals shall be located in the center of the street." I represent the railroads on the American Engineering Council, which has presented its report and its recommendations for traffic signals are as follows:

"All traffic control signals should be so placed that the lights are plainly visible to the traffic to be directed.

"The type and location of lights should be as follows (named in the order of preference): Four-way signal on post or bracket at each corner." (That is your Chicago loop system.) "Three, two or one-way posts, signal on post or bracket at each far corner. Three-way or two-way signal on post or bracket at near corner. Four-way signal suspended over the center of intersection. Four-way post on the safety island. Four or two-way signal on brackets on diagonal corner.

"The use of four-way signals on posts and safety islands is limited in application to streets wide enough and with sufficient density of vehicle traffic to warrant such islands.

"The use of post signals at the centers of the intersections is not recommended, because they form unnecessary and dangerous obstructions."

Yesterday in the convention of the Signal Section, A. R. A., there was considerable discussion on the proposition of having these signals which are located on the right of traffic duplicated; that is, the lights placed back to back, so that a driver approaching will see the flashing-light signal on his right before he gets to the crossing, and he will see a flashing-light signal on the left, beyond the crossing.

I should like to have the reference to the center location eliminated for this year anyway, because I believe that in the course of another year or two, we will have to double up the signals, and the driver will get an indication from the signal on the right, the near side, and the signal on the left, the far side. It would eliminate the objection of putting the signals in the center of the highway and also will give him the visibility which is desired.

Mr. Ford: I hope the committee will not yield to this. The Rock Island has these signals placed exactly in conformity with the recommendations made by this committee. They have proved to be safe and one of the best means of regulating traffic that we have in any of our large cities. We have these signals installed on our suburban lines, in one case on one of the heaviest traffic streets in Chicago, where two railroads are using a double-track line, where there is a train every 40 minutes during the day, and during the peak hours a train every 8 or 9 minutes, and we have no trouble whatever. Not only that, but it meets with the approval not only of the city but of the community in which the service is given. This same character of service has been extended and has been watched not only by the Rock Island but by other railroads interested. The recom-

mendations of the committee are sound and should stand.

Mr. Blum: This subject was fully considered at our last meeting of the entire committee, and therefore I cannot withdraw the recommendations.

The Northern Pacific has a large number of the center of the road installations and their results as compared with the side of the road installations have been satisfactory. For that reason I am in favor of the recommendations as presented.

Mr. Rudd: The elimination of these words will not weaken this very much. The signals can still be put in the center of the road if the people want them there. The objectionable feature is that they say they shall be placed there.

Mr. Blum: Under certain conditions.

Mr. Rudd: And they will not be, because some states will not permit the obstructions in centers of highways in cities. If you want a standard, let us have one which can be made workable.

[*The motion with regard to wigwag and flashing-light signals was carried.*]

The committee made a progress report on the Economic Aspects of Grade Crossing Protection in Lieu of Grade Crossing Separation, which was read by Subcommittee Chairman A. H. Utter (C. B. & Q.).]

Vice-Chairman Ringer: Subject No. 5, Evolve a Formula Which Will Develop and Evaluate the Relative Benefits to the Public and Railways From: (a) Grade Crossing Protection; (b) Elimination of Grade Crossings; (c) Reduction of Traffic on Highway Grade Crossings, will be presented by R. B. Kittredge, State University of Iowa: The committee is recommending the adoption of the conclusions to its report, and *I move that conclusions 1 to 3 inclusive be adopted for inclusion in the Manual.*

Mr. Ford: I ask the committee to delete the words "cannot be evaluated by a formula." If they leave that out, I think they have done exactly what the board asked them to do.

Past-President J. L. Campbell: The committee has no objections to the exclusion of these words.

V. R. Walling (C. & W. I.): Under Item (c) the committee has enumerated automobiles, trucks, horse-drawn vehicles, and so forth. I wonder if it might not be well to include "pedestrians."

Past-President Campbell: The committee will accept your suggestion.

J. A. Peabody (C. & N. W.): In considering pedestrians, I think it would be well to separate school children from grown people. We get a record separately of the two items.

Vice-Chairman Ringer: I see no objection to a word to divide the pedestrian traffic. However, these are general principles, and the manner in which the report comes in would include all pedestrians.

Past-President Campbell: The motion is to adopt the recommendations of the committee as they have been amended.

[*The motion was carried.*]

Mr. Ford: The report states: "The principal benefit from grade-crossing protection is the reduction in the number of crossing accidents." I want to take issue with the committee on that statement. The principal benefit is the speeding up of highway traffic. The time has gone by for considering grade crossings from a purely accident-prevention standpoint. Consistent and persistent education of the public aided by suitable legislation will secure a great reduction in accidents.

The point I want to make is this: There seems to be an impression among state and federal authorities that the reason grade separation is necessary, and should be paid for by the railroads, is on account of grade-crossing accidents. The result is that a large per cent of the cost is saddled on the railroads. Fundamentally that is incorrect. The time and conditions have changed. Accidents can be prevented by proper educational methods and by automatic protection.

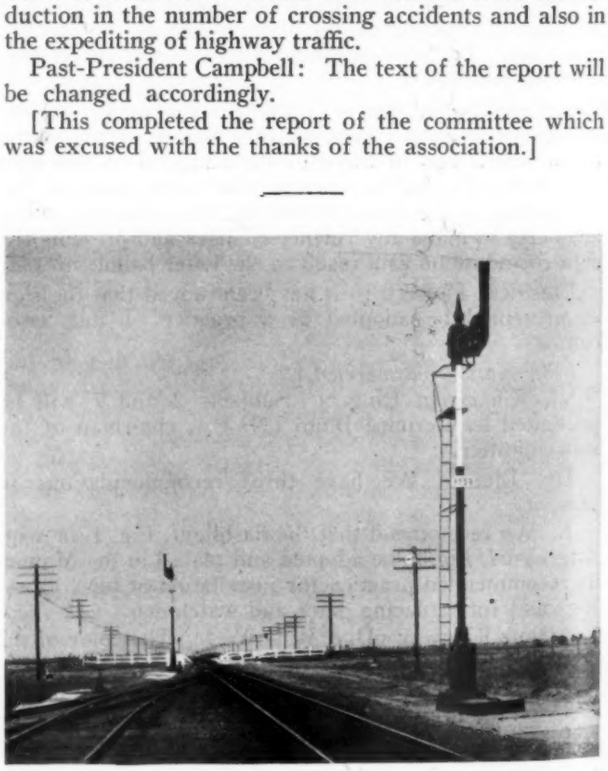
In most cases crossing separation is made for the convenience and necessity of the highway user. It is true, of course, that the railroads get a benefit from it. The benefits can be allocated so as to get away from armitrary adjustment. We should no longer make an arbitrary 50 per cent division of cost, because each party is not benefited equally. I hope the committee will correct those paragraphs so as to state the situation correctly and make it consistent with what they have said on the following pages.

E. R. Lewis (M. C.): I agree with the last speaker. The pressure that is being brought to bear on the railroads today to separate grades is because of congestion of traffic on the streets. The day has gone when the accident takes first consideration. We are approaching the time of saturation on the streets, when the crossing of greatest importance in grade separation is of highway with highway.

Vice-Chairman Ringer: The committee discussed at length the points raised by Mr. Ford. Some difference of opinion developed as to the extent to which any crossing protection would speed up the highway traffic. I would feel that Mr. Ford's remarks would apply more to grade separation than to grade crossing protection. However, this matter is for information, not for inclusion in the Manual. The committee sees no objection to changing the first sentence to include both benefits from the reduction in the number of crossing accidents and also in the expediting of highway traffic.

Past-President Campbell: The text of the report will be changed accordingly.

[This completed the report of the committee which was excused with the thanks of the association.]



Semaphores at End of Siding on Santa Fe Coast Lines

Report on Signals and Interlocking

Train operation by signal indication explained with data on installations in service

W. M. Post
Chairman

THE Committee on Signals and Interlocking presented as information reports covering the following subjects: 1. No revision of Manual recommended. 2. Report on developments of automatic train control, collaborating with Train Control Committee, A.R.A. (Appendix A). 3. Report developments of automatic highway crossing protection, collaborating with Committee IX—Grade Crossings (Appendix B). 4. Report on increased efficiency secured in railway operation by signal indications in lieu of train orders and timetable superiorities, collaborating with Committee XXI—Economics of Railway Operation (Appendix C). 5. A synopsis of the principal current activities of the Signal Section, A.R.A., supplemented with list and reference by number of adopted specifications, designs and principles of signaling practice (Appendix D).

The report on automatic train control was summarized in a few paragraphs, abstracts of which are as follows:

No important developments have been made in the automatic train control field since the publication of the last report. No orders have been issued by the commission regarding the installation of train control, except such as extended the time for completion, or affected the equipment of certain locomotives with the commission's orders.

There has been no change in the number of roads required to make an installation, but four of the carriers mentioned in the order, the Chicago & North Western, Michigan Central, New York Central and Southern, have made voluntary installations. The Pennsylvania is arranging for a cab signal installation between New York and Philadelphia. All the installations ordered by the commission have been completed.

As a part of this report on train control, Exhibit A gave a list of the train control installations on the roads included in the commission's orders, showing the track miles and locomotives in each case. A similar list shown as Exhibit B, gave the same data concerning additional installations not included in the orders but made voluntarily by the carriers. Exhibit C included abstracts of the reports of the Interstate Commerce Commission's final inspections of train control installations on reports issued during the past year. These reports have been published currently in the *Railway Age* and *Railway Signaling* and are not repeated here.

Appendix B—Development of Highway Crossing Protection

Members of the committee have had several conferences with members of the Committee on Grade Crossings, and the chairmen of the sub-committees have had considerable correspondence. Meetings of the American Engineering Council and of the new committee of the American Standards Association Committee on Street Traffic Signs, Signals and Markings have been held and reports prepared for final revision. These reports should issue during the winter.

Committee X presented a verbal report as follows:

Summary of verbal report to be presented at convention to come in here.

Appendix C—Report on Increased Efficiency Secured in Railway Operation by Signal Indicators in Lieu of Train Orders and Timetable Superiorities

Train operation by signal indication was first put into successful use in 1882 on the Pennsylvania at Louisville, Ky. This method of directing train movement, therefore, ii not new in principle. The Louisville installation led to a similar one in 1889 on the Nashville, Chattanooga & St. Louis Railway, near Chattanooga, Tenn. In both of these installations train movements were directed by signal indications given under the instructions of the dispatchers and without the use of written train orders.

It was not until 1907, however, that this method of operation received substantial recognition, following an installation made on a single-track line in which track circuits, for controlling the manually operated signals, fully established the efficiency and reliability of the method as a means for directing train movements without train orders on single-track lines.

This installation was soon followed by many others so that today over 100 installations have been made on 31 railroads in this country and Canada, with a total of 1,763 track miles, consisting of 613 miles of single track and 1,150 miles of multiple-track lines for "either-direction" operation, for directing train movements by signal indication without the use of train orders.

This mileage represents lines on which, with but few exceptions, there is heavy traffic movement and more than ordinary demand upon track capacity. In many of the installations the greater capacity provided by this efficient method of operation postponed the necessity for building and maintaining many miles of additional track, thus effecting substantial savings in both construction and maintenance costs.

In the past two years a greatly improved system of train operation by signal indication has been developed. The new system simplifies the work of the train dispatcher and enables him to increase substantially the output of transportation, especially on single-track lines. In this new system, the signals and switches of a district are operated and controlled from a central point by a dispatcher solely by the use of electrically operated signaling devices and without the aid of operators. The dispatcher directs the movement of trains by operating the signals whose indications authorize the movement. By direct operation of the switches as well as the signals, the train dispatcher also sets up the routes as required. Through the elimination of the task of issuing written train orders, the dispatcher can concentrate all of his efforts on keeping trains moving with minimum delay and thus assure a maximum utilization of trackage and equipment together with a greatly reduced accident hazard.

Three Methods of Directing Train Movements

A brief review of the three methods of directing train movements, as presented by the committee, included an explanation of: (1) Timetable and Train Orders—the time interval method, (2) Timetable, Train Orders and Block Signals—a space interval system, and (3) Signal Indication—a space interval method which was explained as follows:

In this method of operation, the indications of the signals govern train movements, as set forth in the Standard Code rule as follows:

"Controlled manual block signals govern the use of blocks and unless otherwise provided their indications supersede timetable superiority and take the place of train orders * * *." (Rule C-305.)

A recent ruling by the Operating Division of the A.R.A. is a further recognition of this method of directing train movements by signal indications. This ruling is as follows:

"Where the movements are fully protected by signaling devices the full utilization of the track systems (track facilities) should be taken

advantage of and that in the absence of such signaling, operation should be conducted by train orders."

This ruling means, in other words, that where an adequate signaling system provides signals that can be used in directing train movements, the indications of these signals will be the sole authority for these movements. Train orders will then be unnecessary except in cases where the instructions are of such a character that they cannot be given by signal indications.

Under a heading, "The Development of Train Operation by Signal Indication on Single-Track Lines," the committee gave in brief a description of several earlier installations which were described in detail in a report of the convention of the Signal Section, A.R.A., for March, 1925. The remainder of the report on the subject of train operation by signal indication is here given in abstract.

Development of Train Operation by Signal Indication on Multiple-track Lines

Train operation by signal indication without train orders on multiple-track lines *with* the current of traffic was in use as early as 1890-91 on the New York Division (four-track line) of the Pennsylvania. The American Railway Association officially recognized this method of operation in 1903 and *against* the current of traffic, "either direction" operation on double track, by means of block signals, in 1904.

The problem as stated by the Association in 1903, as follows:

> "The term 'operation without train orders' is, of course, something of a misnomer. The system contemplates rather a change in the manner of delivering orders (by signal indications), the method of working under them and by relief of the engine and train crews from the frequent necessity of performing more or less complicated arithmetical problems in order to determine exactly what their orders are. With a train scheduled at a certain time for every station on a division and with an order requiring it to run one hour and thirty minutes late from a certain point, the possibilities of error in the calculation of time are large. The fact also that freight trains are required to keep out of the way of trains of a superior class running in the same direction involves either undesirable delays in waiting at passing stations or the taking of long chances in getting to the next passing point * * *."

Today it is common practice on multiple-track lines to govern the movement of trains with the current of traffic by block signals. A notable step in this direction was made by the Erie in 1910 on its double-track divisions by the use at non-interlocked switches of signals giving three indications: "hold main," "take siding" and "stop." These signals were used by train dispatcher in directing train movements by sending to the operators directly controlling the signals telephone instructions as to the indications to be displayed. Through the use of these signals on the important divisions of the Erie, train orders were practically eliminated.

Comparison of the Three Methods of Directing the Movements of Trains

The three methods of directing the movements of trains as previously described are: (a) By timetable and train orders. (b) By timetable, train orders and block signals. (c) By signal indications.

In the two methods that use timetables and train orders, the train order plays the leading part, particularly in directing train movements on single track. It is estimated that some 5,000 train dispatchers on the roads of the United States issue for directing train movements, no less than 130,000 train orders daily, or close to fifty million train orders annually.

The difference between train orders and signal indications as a means for directing train movements may be summed up as follows:

Train orders are written instructions that must be delivered to the conductor and engineman of the train. They must be correctly prepared, transmitted, delivered and understood. *They must not be forgotten.* On roads *not* equipped with modern signaling systems, safety of operation depends entirely upon the human element, for there is no check either electrical or mechanical to prevent an improper train movement should an error occur in the preparation, transmittal or delivery of the order, or should the order be misunderstood or forgotten.

In directing the movement of trains by train orders, seven standard forms are used for the following purposes:

For fixing meeting points.
For directing a train to pass or run ahead of another train.
For giving right over an opposing train.
For authorizing a train to run late (time order).
For holding trains.
For directing a movement against the current of traffic.
For authorizing the use of a section of double track as a single track.

Signal indications, on the other hand, are simplified instructions for directing the movement of trains given by the aspects of fixed roadside or cab signals. As signal aspects are few in number, there is but little opportunity for msiunderstanding their indications.

The train order calls for deferred action, whereas the signal indication, conveying instructions at the points where they are to be executed, calls for immediate action. Hence there is no lapse of time in which to forget the instructions. The signal indication is a "do-it-now" order.

Operation by train orders requires delivery of the order to the train. If in motion, the train must slacken speed or stop to receive the train order instructions as to how it should proceed. As train orders are for the ultimate purpose of keeping trains moving, this slowing down or stopping for the delivery of orders in a measure defeats this purpose. The signal indication method on the contrary does not require the train to stop for proceed instructions.

The train order method when it retards the movement of trains causes loss of time. Delayed trains unnecessarily obstruct the tracks they occupy. Delayed trains reduce the output of transportation and increase train costs. To produce transportation, trains must be kept moving; hence the train order method when it unnecessarily retards or stops the movement of trains tends to limit the production of transportation.

In directing train movements by signal indicator, two types of signals are used:

(a) Interlocking signals that govern and are the authority for the use of the routes of an interlocking plant. An interlocking plant at a large terminal through which train movements are made under the direction of the train director and by authority of the interlocking signals is a fine example of train operation by signal indication. The hundreds of interlocking plants in use today are ample proof of their reliability and efficiency.

(b) Controlled manual blocks signals that govern and are the authority for the use of the blocks. Their indications supersede timetable superiority and take the place of train orders.

NOTE.—Interlocking signals are also used in controlled manual block systems both as interlocking and as block signals.

The installations for the operation of trains by signal indication, described in this report, are for two purposes: (a) For operation on single-track lines. (b) For "either-direction" operation on one or more tracks of multiple-track lines.

All of the installations described with the exception of the two made prior to 1907 are, in effect, controlled manual block systems with all the safeguards inherent in such systems. The installations of train operation by signal indication are operated in two ways:

(a) The method generally in use is one in which the control

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of the signals is directly in the hands of the signalmen or operators, working under the general direction of the train dispatcher through telephone instructions.

(b) The other and latest method is one in which the dispatcher directly controls and operates both signals and switches on the line without recourse to operators, and has before him a visual indication of the location of trains at any moment as well as a graphic record of their previous movements.

Two notable installations of the dispatcher control type have been put in use on single-track lines; one on July 25, 1927, on the New York Central between Toledo, Ohio, and Berwick, 40 miles (see Railway Age, August 20, 1927); and one on July 1, 1928, on the Pere Marquette between Mount Morris, Mich., and Bridgeport, 20 miles. (See Railway Age, October 6, 1928.) These two installations represent the very latest development in train operation by signal indication, in which the signals are directly controlled from a central point by a train dispatcher who directs all train movements by signal indication without the use of train orders and in addition operates the switches at the passing sidings. (See article Train Operation by Signal Indication by H. M. Sperry, Railway Age, June 4, and 11, 1920.)

With the present development of the art of signaling, the direction of train movement by signal indication, without the use of written train orders, is in every detail simple and feasible. The methods employed in the installations described in this report have met with the approval of the most conservative railway authorities.

Economic Advantages of Train Operation by Signal Indication

(1) Delays Are Reduced.—A train order, ordinarily prepared on estimates of future performance, takes into account the movements to be made during an hour or more (often several hours) after the order is issued. Failure by the superior train to meet the expected performance ties up the inferior train. Because the train order system requires so much time it is not always possible to afford relief to the inferior train by new orders, and substantial delays are unavoidable. Under operation by signals no time is required to change the lineup. The dispatcher can operate from minute to minute instead of from hour to hour. By directing train movements by signal indications in place of by train orders, slow-downs or stops for orders are eliminated and trains are kept moving.

When passing siding or other switches are operated by interlocking or by remote power switch machines, the train stops to throw the switches are eliminated and the trains are kept moving.

(2) Track Capacity Is Increased.—When delays are reduced and trains kept moving, track capacity is increased. When the capacity of single-track lines is increased, double tracking (often prohibitive in cost) can be postponed. When the capacity of two or more track lines is increased by "either-direction" operation, the construction of additional main tracks can often be postponed. NOTE.—For roads reporting installations that have substantially increased track capacity, see list of installations of Train Operation by Signal Indication.

(3) Safety Is Increased.—Train operation by signal indication provides operating facilities that greatly reduce operating hazards. These facilities are:

(a) Automatic and controlled manual block signal protection.

(b) Dispatcher or operator control of the signals in use at points where it is necessary to direct or authorize train movements (e. g., at passing siding switches, ends of double track, junctions, crossovers, etc.)

(c) Dispatcher or operator control of switches (those in frequent use) by interlocking or by remote power switch machines.

(d) An automatic train movement board for visualizing the location of trains at any moment or indicators for announcing the trains, thus giving the dispatcher or operator the necessary "OS" information for each train. (A development of the "memonic" board used in the Louisville installation in 1882.)*

(e) Central control of the system by which the dispatcher directs the movement of trains by signal indication without the use of train orders. This central control is of two kinds: Where the dispatcher directs train movements by telephone instructions to the operators directly in control of the signals and the switches. Where the dispatcher directs train movement by *directly* controlling and operating the signals and the switches.

*NOTE.—Graphic train charts for visualizing train movement records are extensively used by many foreign railways. See Train Operation by Signal Indication, Bulletin 3, by H. M. Sperry, New York.

Train operation by signal indication further promotes safety by reducing train delay. (It has been well said that a standing train is a liability.) When train delay is decreased and trains kept moving, safety is increased.

(4) Freight Train Operating Costs Are Reduced.—Operating costs are reduced when delays are reduced. When freight train delay is reduced by eliminating unnecessary stops the average train speed between terminals is increased without increasing the speed while in motion. Average speed increased in this way tends to decrease train hours, crew overtime and fuel consumption and to increase track capacity.

When train hours are decreased the time saved is a measure of the increased efficiency of the transportation machine. This increased efficiency means that less labor and fewer cars and locomotives will be required to produce a given output of ton-miles, thus reducing the cost of operation.

Increased track capacity postpones the need for additional main tracks. The records of many of the installations of train operation by signal indication show that heavy expenditures for additional main tracks were postponed, effecting large savings in operating, maintenance and interest charges.

In giving consideration to the economics to be effected by train operation by signal indication, the cost of installation must be balanced against the estimated savings. The result may or may not justify the installation. The successful operation of our roads by time-tables, train orders and block signals should also be taken into account and the cost of train operation under this system weighed against the cost of train operation by signal indication. The economic advantages of one system over the other should determine the system to be used.

One collateral advantage should not be overlooked. Much has been said recently about the improvement in the quality of railway freight service from the viewpoint of the shipping public. That service is now more expeditious and more dependable than ever before. To that result the greater use of modern signaling has contributed a substantial part. Further reductions in avoidable train delays will bring further improvements in public transportation service.

The operating records made by the installations of train operation by signal indication now covering 1,703 track miles, show substantial economic advantages through a reduction in train delays: an increase in ton-miles per train-hour; a decrease in ton-mile costs and what is most important, an increase in safety.

Economics of Railway Operation

Table I—Train Operation by Signal Indication Without the Use of Written Train Orders lists the installations on the railways of the United States and Canada for train operation by signal indication on single-track lines and for "either-direction" operation on one or more tracks of multiple-track lines. The installations for the purpose of directing train movements by the indications of fixed (wayside) or cab signals are of two types:

(a) Installations in which the operators directly control the signals and switches and direct the train movement under telephone instructions of the dispatcher.

(b) Installations in which the dispatcher directly controls the signals and switches and without the aid of operators, directs the train movement (central control system).

"Either-direction" operation within interlocking territory as in large terminals and normal direction operation on multiple tracks are not included in this list. The list arranged in chronological order includes all installations (as far as it has been possible to obtain the records) that have been made on the railroads of the United States and Canada since the first installation in 1882. All the installations with three exceptions are still in use. All but three installations are in effect controlled manual block systems with all the safeguards inherent in such systems, such as traffic locking, semi-automatic signals, etc. The three exceptions are manual block systems and are so noted.

TABLE I—INSTALLATIONS OF TRAIN OPERATION BY SIGNAL INDICATION

		Miles of Track			
Year	Road and Location	Single Track	Double Track	Three Track	Four Track
1882	Penn., Louisville Bridge, Louisville, Ky., Manual block, Central control	5.5	2.5		
1883	B. & M., Salem Tunnel, Mass.	1.0			
1888	C. B. & Q., Chicago to Aurora, Ill. Either-direction middle track			34.	

TABLE I—INSTALLATIONS OF TRAIN OPERATION BY SIGNAL INDICATION

Year	Road and Location	Miles of Track—Single Track	Double Track	Three Track	Four Track
1889	N., C. & St. L., Chattanooga Tenn. Manual block. Replaced by double track in 1912	4.4	1.6		
1907	Penn., Huntley, Pa., to Cameron	5.0	3.5		
1908	B. & O., Brook, Pa. to Confluence	4.4			
1909	C. N. E. (now part of the N. Y. N. H. & H.), Highland, N Y., to Maybrook. Replaced by double track in 1914	13.2	7.		
1910	A. C. L., Peedee, S. C. Changed to gauntlet, 1925	2.3			
1910	L. I., Locust Valley, N. Y., to Oyster Bay	4.0			
1910	Penn., Penn. Station, New York, "JO" Cabin to Thompson avenue, New York (East River tunnel)			3.0	
1910	Penn. Station, New York, "C" Cabin to Thompson avenue, New York (East River tunnel)			3.0	
1910	Penn., Penn. Station, New York, to Manhattan Transfer, N. J. (Hudson River tunnels)		8.3		
1910	Erie, Jersey City, N. J., to Croxton. Either-direction all tracks				2.2
1911	N., C. & St. L., Cowan, Tenn., to Sherwood	11.0	2.5		
1911	B. & O., Millers, O., to Orleans Road, W. Va. Either-direction one-track			19.4	5.6
1912	A. T. & S. F., Bee Creek Junction, Mo., to St. Joseph, Manual block. Originally staff system	10.0			
1912	B. & O., "Q" to "DA" Towers (Ohio division), Ohio	1.1			
1912	B. & O., Glenwood, Pa., to Rand	2.5			
1912	B. & O., Powell, W. Va., to Kingmont	7.3			
1912	N. Y. N. H. & H., Barrington, R. I., to North Warren. Gauntlet track over two bridges	.4			
1912	Penn., Wolverton, Pa., to South Danville	4.2			
1913	A. C. L., North Tower (Southover), Ga., to Georgia Junction		1.1		
1913	A. C. L., Weldon, N. C. Gauntlet	1.2			
1913	Penn., New Castle, Ind. to Fayne	2.4			
1913	Penn., Spruce Creek, Pa., to Tyrone Forge. Either-direction middle track			7.0	
1913	P. & R., Carlisle Junction, Pa., to Gettysburg. In use 16 days for heavy passenger traffic	25.0			
1913	N. Y. N. H. & H., Worcester, Mass., to South Worcester. Either-direction four tracks				.6
1914	A. C. L., Dunlop, Va., to Collier (Petersburg Belt Line)	5.8			
1914	A. C. L., St. Stephens, S. C., to Santee	3.2			
1914	B. & O., Benwood Loop (Wheeling division)	.7			
1914	B. & O., Sand Patch, Pa., to Manila		1.7		
1914	B. & O., Okonoko, W. Va., to Patterson Creek. Either-direction one track			12.5	
1914	Erie, Pymatuning, Pa., to Sharpsburg	5.0			
1914	Erie, Hubbard, Ohio, to Coles, Pa	9.2			
1914	Penn., Mt. Eagle, Pa., to Howard		5.0		
1915	Penn., Eldorado, Pa., to New Portage	3.3			
1916	B. & O., Pennsylvania Junction, Ohio, to Lake Shore Junction	.6			
1916	St. L.-S. F., Birmingham, Ala	1.0			
1916	W. M., Cumberland, Md., to North Branch	4.0			
	Williamsport, Md. to Clearspring	7.0			
1916	C. B. & Q., Aurora, Ill., to Mendota		47.0		
1916	Penn., Davis, Del., to Ragan. Either-direction middle track			9.1	
	South Fork, Pa., to Sheridan. Either-direction one track				11.2
1917	B. & O., Butler, Pa., to Standard Junction	.4			
1918	Piqua, Ohio, to Kirkwood	5.2			
1918	Erie, Riverside, N. J., to North Hawthorne	1.5			
1918	N. Y. N. H. & H., East Hartford, Conn. Gauntlet track over bridge	.5			
	Poughkeepsie Bridge, N. Y., Gauntlet track over bridge	1.4			
1919	C. & O., Cotton Hill, W. Va., to Gauley	4.0			
1919	L. & N., "FS" Tower, Ind., to Henderson, Ky.	4.6			
1922	D. L. & W., Denville, N. J., to East Dover Junction	2.9			
	"BY" to "RD" Tower, Binghamton, N. Y.		1.0		
	West End, N. J., to Newark. Either-direction two tracks			5.9	
	Newark, N. J., to Milburn. Either-direction one track			8.9	
	Hoboken, N. J., to West End. 0.7 mile in five-mile track territory. Either-direction four tracks				1.9
1923	A. C. L., Doctortown, Ga., to Back Swamp	3.0			
1923	C. & O., Clyffeside, Ky., to West Ashland		4.0		
1923	C. & O., Scott, W. Va., to "DK" Cabin		28.0		
1924	A. C. L., Chatham, Ga., to Sand Island, S. C.	2.6			
1924	C. of G., Macon, Ga., to Paynes	4.5			
1924	I. C., Otto, Ill., to Gilman		20.0		
1924	G. C. & S. F., Fort Worth, Tex., to Saginaw. Heavy switching movement	8.0			
1924	L. & N., Dolen, Ky., to North Hazard	.8			
1924	Erie, Croxton, N. J., to Hackensack River		3.6		
1924	N. Y. C., Grand Central Terminal to Mott Haven, N. Y. Either-direction track No. 4				5.0
1925	C. B. & Q., Pacific Junction, Neb., to Plattsmouth	5.0			
	Greenwood, Neb., to Waverly	7.0			
1925	M.-K.-T., Muskogee, Okla., to Wybark	5.0			
1925	M. P., Kansas City, Mo., to Osawatomie. Includes train control	50.1	5.9		
1925	C. & O., West Ashland, Ky., to Russell. Either-direction all three tracks			3.3	
1925	C. & N., Elmhurst, Ill., to West Chicago. Either-direction middle track			14.0	
1925	I. C., Otto, Ill., to Monee. Either-direction middle track			26.0	
1925	N. Y. N. H. & H., New Haven Station, to Cedar Hill. Either-direction two tracks				1.0
1926	L. I., Whitestone Junction, N. Y., to Whitestone Landing	3.0			
	Great Neck, N. Y., to Port Washington	4.0			
1926	C. R. I. & P., Chicago Terminal (60th to 86th St.) Either-direction one track			3.1	
1926	C. R. I. & P. and N. Y. C. Chicago Terminal (4 and 6 tracks). Either direction tracks Nos. 2 and 5				6.6
1926	C. R. of N. J., "BV" Tower, Bayonne, N. J., to "FH" Tower, Elizabethport. (Four-track draw.) Either-direction all tracks			2.9	
1926	I. C., Chicago Terminal (8 tracks). Either-direction track No. 1				6.0
1927	C. of G., Terra Cotta, Ga., to Carman	23.6			
1927	D. & H., Cooperville, N. Y., to Rouses Point. Also 3 miles of running track adjacent to the single-track line	6.0			
1927	Penn., Henry, Ind., to Gem	16.3			
	Bradford, Ohio, to New Paris	30.2			
1927	N. Y. C. (O. C. L.) Stanley, Ohio, to Berwick. Central control	37.0	3.0		
	Weehawken, N. J., to New Durham (Weehawken tunnel)		1.1		
	New Durham, N. J., to Little Ferry. Either-direction track No. 3				4.6
1927	A. T. & S. F., Fort Madison, Iowa, to Pequot, Ill. Includes cab signals and train control		175.7		
1927	C. R. I. & P., Blue Island, Ill., to Joliet. Either-direction one track		24.0		
1928	C. P., Medicine Hat, Alta., to Dunmore	9.0			
1928	C. B. & Q., West Quincy, Mo.	7.0			
1928	P. M., Mt. Morris, Mich., to Bridgeport. Central control	20.0			
1928	St. L.-S. F., Harvard, Ark., to Bridge Junction	4.8	4.7		
	Nichols, Mo., to Springfield	3.7			
1928	C. R. of N. J., "JU" Tower, Bethlehem Junction, Pa., to "VN" Tower, Rittersville. Either-direction one track			2.4	
	Aldene, N. J., to "QR" Tower, Lorraine. Five-track territory; either-direction one track				2.5
	"A" Tower, Jersey City, N. J., to "BV" Tower, Bayonne. Either-direction one track				6.6

INSTALLATIONS UNDER CONSTRUCTION

1928	B. & O., Grafton, W. Va., to Parkersburg	89.5			
1928	B. & M., Hoosac Tunnel, Mass., to North Adams station. Either-direction all tracks		5.0	1.5	
	North Chelmsford, Mass., to Ayer. Central control		13.0		
1928	C. & O., Cheviot, Ohio	2.0			
	Covington, Ky. Either-direction all tracks		1.0		1.0
1928.	C. C. C. & St. L., Terre Haute, Ind., to Pana, Ill.	90.0			
1928	D. & R. G. W., Tennessee Pass, Colo. (20 miles of double-track normal direction only not included)	3.0			
1928	N. Y. C., Palmyra, N. Y., to Wayneport. Either direction on track No. 1. Train control				10.7
1928	N. Y. O. & W., Fulton, N. Y.	2.3			
1928	T. & P., Dallas, Tex., to Fort Worth. Central control	10.0	20.0		
	Addis, La., to Johnson. Central control	1.0	49.0		
	Totals (each)	613.6	445.2	147.1	68.4
	Total miles of road				1,274.3
	Total miles of track				2,218.9

Discussion

[The report was presented by Chairman W. M. Post, (Penna.) who first reviewed the report on train control.]

Mr. Post: Since this report on train control was submitted, the Interstate Commerce Commission has re-

ported on the hearings which were held last spring. It was clearly brought out that the commission does not intend to let down in any way on advancing safety on the railroads. Apparently it will not be so insistent upon automatic train stops. Other methods will be permitted, and the commission has not issued any order for additional automatic train stop installation. Apparently it will watch the railroads and see what they do to advance safety.

The Pennsylvania is making installations of cab signals on its New York division between Philadelphia, Pa., and Manhattan transfer, near Jersey City, N. J., without automatic train stops. We believe that is added safety protection and that it will be sufficient. The Pennsylvania has also authorized the installation of automatic cab signals on the Pennsylvania between Philadelphia and Washington.

[A verbal report on Highway Crossing Protection was made by A. H. Rudd (Penna.).]

Mr. Rudd: Probably the most important development in grade-crossing protection has been the completion of the report of the American Engineering Council on traffic signals. The National Conference on Street and Highway Safety has practically completed its labors. The associations co-operating in this conference were 10 in number, the American Railway Association being one of them. The report is issued as a report of the Committee of the American Engineering Council on Street Traffic Signs, Signals and Markings, 1929, and may be obtained from the association at 25 cents a copy. Its address is 26 Jackson Place, N. W., Washington, D. C.

It contains a display of unauthorized signs which are forbidden. There are paragraphs requiring the vehicles to stop at railroad crossing signals. It adopted the approach sign, as passed here today, yellow background and black letters, identical with the A. R. E. A. standard, and provides for a crossing sign with two arms mounted across each other, the arms to be at any angle desired. The sign is to be white with black letters. The octagonal stop sign recommended has a yellow background with red letters. It has standardized on the A. R. E. A. standard crossing gate.

[Chairman Post then reviewed the report on Operation by Signal Indications, and *made a motion to adopt it for publication in the Manual.*]

Vice-President G. D. Brooke: What you propose is a revision of the present matter in the Manual under the Economics of Operation committee.

Chairman Post: Yes, it merely brings the Manual up to date to include single track as well as multiple-track lines.

Vice-President Brooke: I think the proper way to handle that will be to bring that up tomorrow when that committee reports and ask for the change to be made at that time.

[*The motion was laid on the table for action at the Thursday meeting.* The report on Signaling Practices was then presented by W. M. Vandersluis (I. C.) for information, and the committee was excused.]

Report on Stresses in Railroad Track

Committee cites progress made and announces the early publication of its investigations and findings

A. N. Talbot
Chairman

THE Special Committee on Stresses in Railroad Track, co-operating with a similar committee of the American Society of Civil Engineers, has continued its work, both the experimental investigation and the study of the data of the tests. With the consent of the president and the secretary of the association, however, it has been considered best to delay the publication of the fifth progress report of the committee and to print it in a number of the bulletin later than the date of the annual convention. The postponement of publication was found to give relief to the pressure of publication work in the office of the secretary, especially as the date at which the report could be presented was necessarily late. Publication prior to the annual convention, too, would necessarily have involved the presentation of some of the matter in an incomplete or unfinished form. The material to be presented is of a nature that cannot very well be presented in parts—at least, its presentation at one time will be much more satisfactory. In the time before its printing, the committee will endeavor to add to the interpretation of the results and to make a further expression of the meaning of some of the information, and to extend the discussion.

The tests relate to the rail joint and to the general conditions of track. The report consists of (1) the general structural action of the rail joint; (2) the mechanics of the rail joint; (3) the laboratory tests; (4) the field tests, and (5) general discussion of the information obtained and its relation to the rail joint in track. The subject as a whole is extensive and complicated; no attempt is made here to summarize the results. It may be noted that the report contains 28 tables, 105 figures, and many pages of text. Published at a time when other new bulletins are not at hand, the committee hopes that its appearance will result in a wider study of the matter than would be otherwise feasible if it were published at the regular time.

Discussion

[The report was presented by Chairman A. N. Talbot (U. of Ill.).]

It had been expected that a rather large report would be ready for printing before this time. It was found, however, that on account of the amount of the material and the complexity of a considerable part of it, that to attempt its publication before the time of this meeting would necessitate leaving part in an incomplete condition. The plan now is to have this printed in a bulletin of the association during the Summer.

The part of the report not yet completed is the general discussion of the information obtained and of the rela-

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tion to the rail joint in track. The subject is extensive and I think rather complicated. In connection with it I may say, however, that the study of the action of the rail joint, is concluded so far as vertical loads are concerned. All these rail joints act as beams, as girders, as a simple beam, loaded near the middle, two inches perhaps back from the rail ends and supported on the base of the rail some distance back of that, the distance varying with the conditions of the joint, say, seven or eight inches away from the rail and in each direction. If the joint is a loose one, the bearing will be farther back; but nearer if the joints are tight and it is a well-fitting joint. This indicates the main way in which the joint functions.

In addition to this vertical movement, with types of bar that are not symmetrical with respect to horizontal axis there is the lateral movement. At the top of the bar near the ends of the rail, the bar has contact with the rail when a load is applied. It starts when the wheel is 15, 20 or more inches away from the end of the rail. That moment is developed from that point on.

We should expect that a joint that is operating well is one that would develop about the same moment that is developed in a full rail under ordinary conditions, or under the same conditions. That is what we have taken as being a condition that should be approached so far as possible. And yet it is found that in some of these joints in track, the actual moment developed in the bar may not be more than 20 or 30 per cent as much as that which we would expect in the full rail itself. It is very frequently less than that in the rail itself opposite the joint.

This particular condition is due to a condition of the joint, perhaps to the design of the joint, and that is one of the things that is being taken up in this report.

This bending moment, of course, is the greatest at the rail end where the rails take no moment, and decreases from three to the points of support of the joint bars.

Tie support enters into this. In the laboratory we put on the full bending moment and the joint bars have to take whatever moment is applied, but in the track the reaction of the ties, affect what moment is developed. The reaction of the tie depends upon, first, whether the rail is in contact with the tie and the tie in contact with the ballast, and second, what the support of the tie is in regard to the stiffness of the ballast. Closer tie spacing naturally gives a greater support than is found where the ties are not so closely spaced.

Similarly, in the tie tamping, the stiffer the ballast underneath, after repeated tamping the greater is the amount of reaction taken there rather than in the ties at one side or the other. Engineers of track provide rigid instructions that track men shall not tamp the joint ties any more than they do other ties. At any rate, either they tamp them more, or they tamp them better, for there evidently is a greater resistance to compression underneath the joint ties than is found elsewhere. That is found to be the case in some track as shown by another thing. A stiff rail even on good ballast, is supported at only three or four points in its length under no load. The differences are small, but significant.

We are all confident that the condition of the ballast under the track has a considerable effect upon the results of track, and it is apparent in the tests that ballast that has been in place for a long time and has become compacted, is an important element in making the action of rail joints so that even under bad conditions the track doesn't go to pieces.

Vice-President Yager: We have with us one of our own members and the president of a kindred society, Mr. Elmer Sperry, president of the American Society of Mechanical Engineers, known to you no doubt through his extended inventions, the gyroscope, and for the development of the transverse fissure detector car.

Mr. Sperry: I feel that there is a very definite and important relation between stress in track rails and the development of fissures. Such part of the fissures as are developed through fatigue phenomena is certainly due to stress. We have gone far enough now with the two cars to be "flabbergasted" by what we find. It doesn't seem to follow some of the laws that we expected. We expected to find that these fissures developed along the line of the law of heat. Now we find they do, and in places we find again that they don't. They seem to have a tendency to follow along the line of regional distribution. What can that possibly mean? It seems to me that that points to some conditions of the ballast or sub-ballast as foundation of the track.

Conjointly with this work, the Santa Fe engineers have been good to us. I don't know how to be thankful to all of my friends, I am sure, but they allowed us to come to the track inspection car with the gyroscope on it. We put a special attachment on that car by means of which we could search the surface of each rail. We made a line two inches long representing just exactly what the surface of that rail looked like, not when the track inspector, or track walker, or the section boss looked at it, but when it was under condition of heavy loading. There is all the difference in the world.

As Dr. Talbot has just said, the thing depends upon minute matters, but we found that they were not so minute. The track was one thing when you looked at it, but when you jumped on it, it was quite another thing, especially on curves when we took those curves at high speed with the car.

There is where the surprise came in. They were fine tracks, with hard, glassy surfaces of steel rail, which looked in perfect alinement, but when we jumped upon them they were not in alinement at all. The track had humps in it, had hollows in it. So there is a thing that I feel might explain some of these observations that we have made with regard to fissures being developed in regional localities.

I feel that not only rail-joints, but the sub-foundation of our tracks, cannot be too well looked upon.

[Without further comment the committee's report was received and the committee excused with the thanks of the association.]

Report of Committee on Electricity

Committee studied design of rail bonds and discussed design of substations—Incandescent lamp schedule revised

S. Withington
Chairman

THE committee presented reports covering the following subjects:

(1) Revision of the Manual (Appendix A).

(2) Inductive co-ordination of traction and communication circuits (Appendix B).

(3) Water power developments on Passamaquoddy bay and on the St. Lawrence river, and the Alabama power development on the Tennessee river; together with development of information regarding the extent of use of water power for railroad operation at the present time (Appendix C).

(4) Collaboration with American Committee on Electrolysis and general study of the subject of electrolysis (Appendix D).

(5) Co-operation with the United States Bureau of Standards in connection with revision of the National Electrical Safety Code, and negotiations with the National Electric Light Association in connection with wire crossing specifications (Appendix E).

(6) Revision of Transmission Line and Catenary Specifications (Appendix F).

(7) Study the economics of railway location as affected by electrical operation, collaborating with Committee on Economics of Railway Location (Appendix G).

(8) Insulating tapes, with especial reference to cambric and paper tapes (Appendix H).

(9) Study of insulators, and investigation of insulators made of boro-silicate glass (Appendix I).

(10) Review of clearances of overhead conductors (Appendix J).

(11) Protection of oil sidings from danger due to stray currents (Appendix K).

(12) Track and third-rail bonds, with especial reference to: (a) Details of bond design with a view to developing specifications covering the different classes of bonds; (b) Collection of information as to methods and extent of practice in reapplying bonds; (c) Collection of data on compositions used, if any, on rail joints to replace bonds; (d) Study of contact areas and resistances for different types of bonds; (e) Compilation of information concerning rail-joint clearance and its effect on rail-bond design (Appendix L).

(13) Revision of incandescent lamp schedule and continuation of study of floodlighting for classification yards and other railroad purposes (Appendix M).

(14) Continuation of studies of design of indoor and outdoor substations (Appendix N).

(15) Cables for carrying high voltages (Appendix O).

(16) Application of corrosion-resisting materials to railroad electrical construction (Appendix P).

The committee recommended that the revised incandescent lamp schedule in Appendix M be placed in the Manual to take the place of the 1926 schedule, which was removed from the Manual by action at the annual meeting in 1928. It also recommended that the reports in Appendices B, D, L, M, N and P be received as progress reports and that the matter in other reports be received as information.

Appendix B—Inductive Co-ordination

The committee reported that the American Committee on Inductive Co-ordination on which this committee is represented, was inactive during the last year, but it has been tentatively proposed to inaugurate discussions on inductive co-ordination between the representatives of the American Railway Association and the National Electric Light Association, and also with the American Telephone and Telegraph Company, which it is intended will to some extent cover the scope of that committee.

In view of recent developments in the field of inductive co-ordination, the committee prepared a statement of the fundamental principles of that subject as a guide to the study of the problem. The chief difficulties experienced in communication circuits were classified as follows:

Noise, on account of induced voltages of audible frequency due to harmonics or commutation ripples.

False ringing on telephone circuits and "chatter" on telegraph and printing telegraph circuits.

Fire hazard, electric shock, or interruption of service due to high voltage in communication apparatus.

Acoustic shock due to sudden heavy flow of current and unbalanced telephone circuits.

The committee also described the methods adopted on important single-phase electrification installations which have been made recently, including the Virginian, the Pennsylvania, the New York, New Haven & Hartford, the Long Island and the Illinois Central.

Appendix C—Water Power

The committee stated that no actual construction work had been started on either the Passamaquoddy Bay or St. Lawrence river projects and that owing to the unsettled status of the developments on the Tennessee river, it was deemed best not to visit the Muscle Shoals plant until definite action has been taken to place the plant in operation.

As a matter of information, the committee presented a synopsis of the water-power policy of the United States as embodied in the Water Power Act of June 10, 1920. It also presented the definitions and tentative rules prepared by the Sectional Committee of the American Engineering Standards Committee on the rating of the flow in rivers.

The statement of electrified steam roads in the United States was brought up to 1927 and showed that in that year a total of 3,790 miles of track were electrified with 1,203,291,000 k.w.h. available at the power houses for train operation. Of these totals, 1,265 miles, or 33 per cent, was operated by elec-

tricity generated by water power and approximately 200,000,000 k.w.h. available at the power houses.

Appendix D—Electrolysis

The committee described the steps taken to guard against electrolysis in the design of the electrification of the Chicago terminals of the Illinois Central; together with the measures that have been taken since this installation was placed in service.

Appendix E—Co-operation with the U. S. Bureau of Standards

The committee reported that there had been no meetings with the U. S. Bureau of Standards during the last year, but that it had been negotiating with the National Electric Light Association with a view to establishing a set of practices and principles covering the crossing of power wires over railways and that the matter is progressing satisfactorily. It also presented a table showing information as to 44 power-wire crossing failures occurring between May, 1922, and March, 1927, as reported by 17 railways which are members of the American Railway Association.

Appendix F—Overhead Transmission Line and Catenary Construction

The committee had no changes to suggest in the specifications for transmission lines but presented a number of revisions for various sections of the preliminary draft of the specifications for catenary construction for railway use.

Appendix G—Collaboration with Committee on Economics of Railway Location

The committee reported that the Committee on Economics of Railway Location had prepared an excellent report on the design of locomotives with particular reference to the major considerations affecting such design. While it recognized that it was not the province of any committee of the A. R. E. A. to prepare designs of locomotives, it felt that it was proper for a committee to make recommendations as to the considerations governing design and recommended that, after a discussion of the report, the data be referred to the Joint Committee on Electric Traction.

Appendix H—Standardization of Insulating Tapes

The committee made a study of this subject with special reference to varnished cambric and paper tapes. It reported that the Insulated Power Cable Engineers' Association is preparing specifications for should soon be completed, and that the American varnished-cambric insulated wires and cables which Society for Testing Materials is preparing specifications covering methods of testing varnished-cloth tapes. These specifications will be of great help to the committee, which felt that any specifications it prepared should be timed to follow rather than precede their issuance. The committee stated that its work concerning paper insulation had not progressed sufficiently to make an extended report.

Appendix I—Standardization of Insulators

The committee does not believe that a revision of the specification should be made at this time. Some changes in definition have been proposed by the Insulator committee of the American Institute of Electrical Engineers. These were approved by this committee and the changes will be included in a further revision of the specification.

The committee investigated the use of insulators made of boro-silicate glass and was of the opinion that pin insulators of proper design made of this material are suitable for transmission lines.

Appendix J—Clearances for Third Rail and Overhead Working Conductors

No definite conclusions as to new clearances were reached and it was decided at the August meeting of the Committee of Direction of the Electrical Section that progress was not to be expected from this commitee until the Special Committee on Clearances had acted.

Appendix K—Protection of Oil Sidings from Danger Due to Stray Currents

From the information gathered during the year, the committee considered it advisable to present a new draft of these rules in 1929, to include Rules for Protection from Danger Due to Static Electricity.

Appendix L—Specifications for Track and Third-Rail Bonds

The committee presented a report outlining its studies of the details of bond design with a view to developing specifications covering the different types of bonds and the points to be considered in such specifications. It also collected and presented data as to the methods of reapplying bonds and the extent to which this practice is followed. It stated that it was unable to obtain any accurate information as to the results obtained by the use of compositions on rail joints to replace bonds but understood that this method is to be tested by one road on a few

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C. G. Winslow, asst. el. engr., M. C., Detroit, Mich.
R. P. Winton, catenary engr., N. & W., Bluefield, W. Va.
G. I. Wright, engr. el. tr., Reading, Reading, Pa.
W. P. Monroe, Lackawanna Terminal, Hoboken, N. J.

joints. The commitee also presented the results of its study of contact areas and resistances for various types of bonds.

Appendix M—Illumination

The committee prepared a revision of the incandescent lamp schedules which it presented for approval for inclusion in the Manual and stated that it was preparing specifications for incandescent lamps.

The committee also presented a report embodying the general engineering features to be considered in laying out installations of floodlighting for railway yards and an outline of the methods which experience or experimentation has indicated to be representative of the best practices. The report contained a list of definitions covering the terms used in connection with floodlighting work.

Appendix N—Design of Substations

The report on this subject covered the consideration of conditions affecting the selection of indoor and outdoor types of stations; the applicability of the various methods of control; the present development and major considerations in the selection of the equipment, including protective devices and the design best fitted to obtain a maximum of safety and continuity of service.

Appendix O—High Tension Cables

The committee reported that no new developments of importance had come to its attention during the year and stated that it had decided to confine its attention to voltages over 25,000, as the American Engineering Standards Committee is working on the standardization of cables for voltages up to that amount.

Appendix P—Corrosion-Resisting Materials for Railroad Electrical Construction

A study was made of the use of copper-bearing structural steel for catenary bridges and transmission towers, and of corrosion-resisting materials suitable for catenary messenger or catenary hardware. In the consideration of these materials, the committee presented such data as it was able to obtain on the corrosion-resisting qualities of copper-bearing steel, aluminum and aluminum alloys, chromium-alloy steel, copper-coated steel, nickel alloys, copper, brass, and bronze, including aluminum bronze and manganese-silicon bronze alloys. The committee recommended that arrangements be made to carry on comprehensive tests for the corrosion-resisting characteristics of all available materials suitable for railroad electrical construction.

Discussion

Sidney Withington (N. Y., N. H. & H.) Chairman: This is now a joint committee with the Electrical Section of the American Railway Association.

It is recommended that the report on inductive coordination between traction and power circuits be accepted as information, and that the subject be continued.

[The report on the study of water power developments which have recently taken place was presented by Subcommittee Chairman R. J. Needham (C. N.) the report being accepted as information and the subject continued. The report on electrolysis was presented by A. S. Cutler (Univ. of Minn.).]

Prof. Cutler: It is the recommendation of this committee that representation upon the American Committee on Electrolysis be continued, and that the subject of Mitigation of Electrolysis on the Illinois Central, Chicago Terminal Electrification be accepted as information.

[The report on Co-operation with United States Bureau of Standards in connection with revision of the National Electrical Safety Code, and negotiations with the National Electric Light Association in connection with wire crossing specifications was accepted as information. The report on the Revision of Transmission Line and Catenary Specifications was presented by G. I. Wright (Reading).]

Mr. Wright: The question of nomenclature of different types of catenary has been agreed upon, something that has been mixed up in the past. The committee has also given consideration to the subject of flashover values for insulators used on catenary construction, as well as to detail component parts going into catenary construction. Considerable work has been done but the matter is not in shape to submit for definite recommendations.

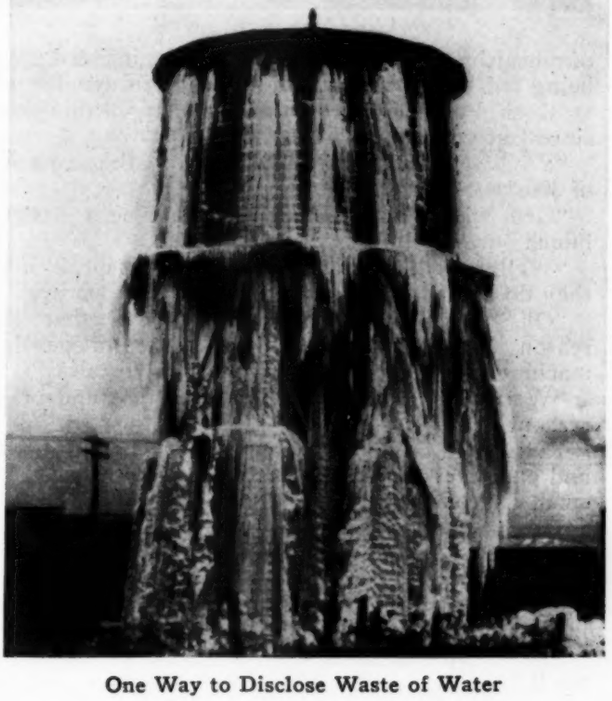
The question of revising the catenary specifications was affected by the fact that Sub-Committee No. 5 is negotiating with the National Electric Light Association to agree upon satisfactory wire crossing specifications. It is recommended that the subject be continued.

[The reports included in Appendices G to P inclusive were each presented by the respective subcommittee chairmen assigned to these subjects and the work was continued for next year.]

Chairman Withington: That ends our technical report. Mr. Vandersluis, chairman of the subcommittee, will present the report on the revision of the manual.

W. M. Vandersluis (I. C.): Subcommittee No. 13 recommends that the new Incandescent Lamp Schedule be placed in the Manual, *and I so move.*

[*The motion was carried.* This completed the work of the committee which was excused with the thanks of the association.]



One Way to Disclose Waste of Water

Little Rollo and His Pop

Chapter III. Wherein the little nuisance proves that he is just that, while bumming around the Coliseum

THERE was much excitement at the Coliseum yesterday. In fact, Secretary Kelly of the N. R. A. A. had to call out a special gang of men to repair the havoc wrought by a certain lad. Pop took Rollo to the Coliseum with absolutely no misgivings, even though he knows that Rollo has two standards of behavior. Some days he is bad and some days he is worse. The way in which Rollo argued with the conductor of the Wabash avenue street car should have warned Pop, but it didn't. He went blithely ahead and took the young holocaust to the Coliseum, just the same.

The first part of the visit passed peacefully enough, further lulling Pop into a false sense of security. As usual, Rollo was much interested in the decorations. He stared open-mouthed at the rainbow effect on the ceiling. But mere beauty cannot hold the attention of an active young lad for long. The pangs

of a healthy appetite seized him and he insisted upon being fed before viewing the exhibits in detail.

"Gosh, Pop," he piped, "they've enlarged this place since last year, haven't they?"

"Yes," agreed Pop, "it now has a seating capacity of 300."

"Gee, whiz, the N. R. A. A. must be a hungry bunch," was Rollo's next contribution.

"Well, yes," said Pop, "now that you speak of it, they do seem to be blessed with hearty appetites."

"Oh," commented Rollo brightly, "is that the reason they have that Bromo-Seltzer dispensing machine in the shoe-shining parlor downstairs?"

"Well, yes," replied his Pop, "for that and other reasons."

Rollo went around, stuffing his pockets with books and pamphlets, until he took on the appearance of a small anaconda.

It was shortly after this that the pandemonium began. Rollo stopped in high glee at the booth containing the radio-controlled toy train. He watched the train back up, start, stop, and do all the tricks in accordance with the commands on the telephone.

"Hey, Pop," he said, "ask the man if he will let me try it."

Pop should have known better, but he didn't, and, after some argument, Rollo was duly installed at the controlling telephone. For a short time, moving the train about the track surprised and delighted him, but presently a new idea struck him.

"Hey, train," he shouted into the phone, "go over to the secretary's office and bring my friend, Mr. Greenabaum, over here."

Obediently, the train jumped from the track and started on its errand at high speed. Women screamed and strong men jumped frantically to save their pet corns as the train tore through the aisles. It took 18 minutes, and 22 employees, by actual count, to straighten out the chaos. Rollo was yanked from the telephone in disgrace.

He was very quiet for a time, so quiet, in fact, that his Pop lost sight of him, while talking with C. W. Kelly, secretary of the N. R. A. A. Loud yells soon convinced Pop that something was amiss, and he knew intuitively that Rollo was at the bottom of it. He rushed to the scene of the excitement and there was Rollo, high in the air, where he had climbed to the top of a water spout and couldn't get down. However, Secretary Kelly, with an agility which surprised his friends, climbed up and brought him down safely. In fact, Mr. Kelly had ample opportunity in the next hour or two for demonstrating his agility, for Rollo got up on a crossing gate, on a crane, on signal poles, and, as a climax, got himself wedged into the culvert pipe exhibit.

After that last performance and its accompanying uproar, a large, thick-necked attendant said to Pop: "If you don't keep that brat tied up, I'll throw both of youse out."

It was with a sigh of relief that Pop finally got Rollo to sit down in one of the luxurious track inspection cars that grace the present exhibit. It was late, nearly closing time in fact. Poor tired Pop and equally tired Rollo leaned back with a sigh into the soft cushions. **The lights went out, one by one.** The buzzing scene of activity became quieter and quieter as the last of the salesmen drifted out into the night. But, in the inspection car, Pop and Rollo slumbered on and there, early this morning, a Bukovinian scrublady found them.

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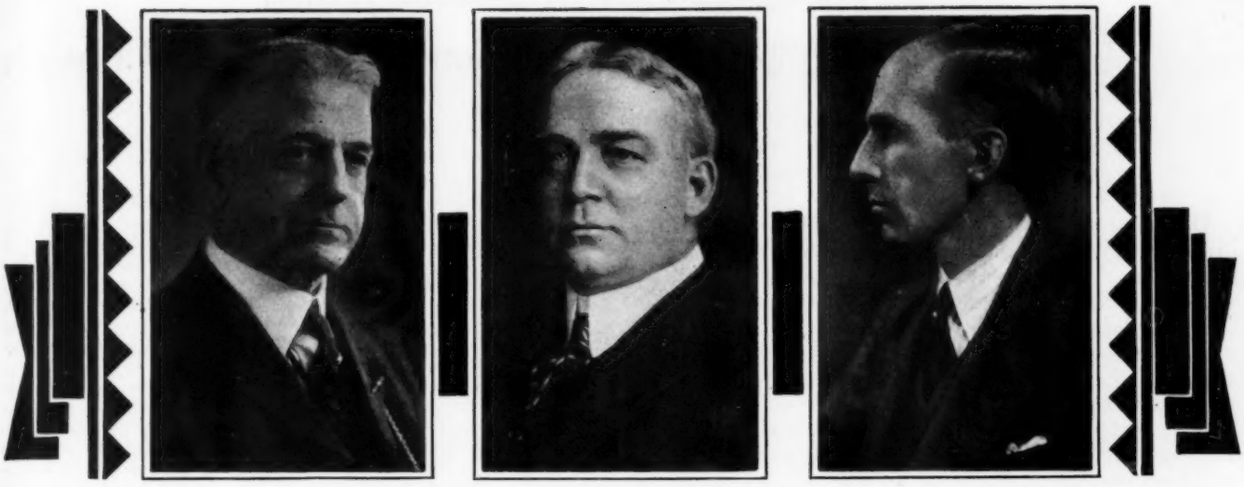


James S. Parker | Whitefoord R. Cole | Vincent Massey

A. R. E. A. Dinner Was Well Attended

Number of members and guests was largest in the history of the association

THE annual dinner of the American Railway Engineering Association, held in the grand ballroom of the Palmer House last evening, was given a railway atmosphere by the displaying of the illuminated name plates of the Pan American Special of the Louisville & Nashville and the Orange Blossom Special of the Seaboard Air Line, in honor of W. R. Cole, president of the former road, who was one of the speakers of the evening, and of W. D. Faucette, president of the A. R. E. A., who is chief engineer of the Seaboard Air Line. The attendance of approximately 1,100 members and guests was close to the capacity of the ballroom. For the first time, lady guests were allowed to dine on the balcony, in addition to the privilege they previously enjoyed of watching the proceeding from that vantage point. A feature of the evening was the presentation of a silver cup to President Faucette by a number of his brother members and other friends on behalf of the association.

President Faucette acted as toastmaster and introduced the speakers of the evening, the Honorable Vincent Massey, envoy extraordinary and minister plenipotentiary from Canada to the United States; W. R. Cole, president of the Louisville & Nashville, and the Honorable James A. Parker, chairman of the Interstate and Foreign Commerce Committee of the House of Representatives. Their addresses are abstracted below.

Some Railroad Problems

By Whitefoord R. Cole
President, Louisville & Nashville

THE basic problem of the railroads is that of adequate revenues and it is somewhat disquieting to note the drift in this regard. To be sure, the rate-making provision of the Transportation Act fixes what shall be just and reasonable rates, such rates as may enable the railroads, under efficient, economical management, to earn a fair return on the value of the property devoted to the public service.

The rate of return has been fixed at 5¾ per cent, but it is a fact that at no time since the Transportation Act has been in effect, have the railroads of this country as a whole earned that rate of return. The alarm expressed over the possibility that, under a valuation of these properties which will give proper weight and effect to existing costs of construction, the railroad rates would rise beyond any reasonable standard, is without foundation.

I think the Interstate Commerce Commission is laboring under the fear of some such thing. But, the net earnings of a railroad have to do only with that part of the charges over and above the operating expenses, and roughly speaking, that represents about 20 per cent of the earnings of a railroad.

Basis for Rate Increases

Increases in rates, where a railroad is already making money, are superimposed on earnings. So that to increase the earnings of a railroad 50 per cent, it is not necessary to increase the rates 50 per cent; but only 10 per cent. Yet, it is widely heralded that, should the bases for reproduction costs be those in effect as of the time of the finding, it would result in an increase of say 50 per cent over the value, toward which the commission is directing its efforts, hence an increase in freight rates and in passenger fares of 50 per cent would be necessary, although nothing of the kind is true.

Inextricably concerned with the question of revenue is this question of valuation. I am not altogether sure that the value of a railroad is the sole standard which should be erected in determining what a railroad shall be permitted to earn, but it is certainly a vital factor, and the law has fixed that yardstick.

The notion of depreciation held by the commission is a wholly untenable one. So far as value is concerned, there is no depreciation in the value of a well maintained railroad. It has always seemed to me that this question has been largely confused with the loss of service life of the units that go to make up a railroad. But the commission is not valuing a lot of crossties and rails and bridges and structures. It is valuing a railroad, a composite transportation machine.

Whatever may be said on this question of depreciation in the value of a railroad, it cannot be said that it is any other than a question of fact, because the Supreme Court itself has laid down that rule; that is to say, it is a fact to be ascertained by observation and not by the calculations involving a theoretical formula, the service life of various units, etc.

Depreciation order 15,100 is not merely an accounting order; it is a valuation order, and the serious aspect of it is in its relation to valuation and not to that of accounting. No one would object, as an accounting proposition, in lieu of the retirement method, to some depreciation accounting which would serve to spread the expenditures, for extraordinary times particularly, over the railroads as the years go by, however, charged off concurrently very much in the way as it is done under the retirement method; but the notion of the setting up of these enormous sums out of current operating expenses, which in the nature of things will never be consumed, and which will inevitably be used to write down the capital value of the railroads, has no foundation in logic.

It is entirely obvious to my mind that the commission's notion of valuation, if permitted to become effective, will bankrupt a respectable proportion of the railways and seriously injure the rest of them.

Reproduction Costs

I am rather convinced that the cost of reproduction of a railroad is not the sole basis for its value. We see many cases of prosperous railroad properties that are worth vastly more than it would cost to build them, and others that are not worth half what it would cost to reproduce them. So there is a fundamental defect there somewhere that has to be met.

Congress never did a wiser thing than when it delegated its rate making power to a continuing body of experts which would be in position to function with as much expedition as importance of the problems permitted and with precedence and accumulated experience and knowledge. Congress could do no more unwise thing, in my opinion, than to reverse that process now and undertake rate making by legislation.

The government goes into transportation itself in competition with the railroads. We have the motor coaches using our highways without assuming, for common carrier purposes, their just share of the burden of the construction and maintenance of those highways, whereas the railroads have to maintain expensive structures on a right of way acquired at high prices as compared with adjoining property.

The theory of barge line business was that it was to be experimentally tried, and if, as and when it appeared that it could be conducted as a business enterprise and would thus attract private capital, the government would retire from it. All I ask of the barge lines is that their accounting be put under the accounting rules of the commission.

I am told that a good deal of that money has to be replaced in units on which no adequate depreciation has been set up. The accounts as submitted by these government-operated transportation agencies which are operating in competition with railroads are not being kept in such a way as they would have to be kept by a private business enterprise, unless it proposed to bankrupt itself. I think if that standard were applied to it the result would not be very encouraging after the government operation of waterways. We have the Panama Canal, we have a little of everything; at times it looks as though no one loves the railroads.

The Consolidation of Railways

By Hon. James S. Parker

Chairman, Interstate and Foreign Commerce Committee, House of Representatives, Washington, D. C.

THE railways are subjected to a tremendous amount of regulatory legislation enacted both by State legislatures and the national Congress and I doubt very much if you fully appreciate the strenuous task that it is to draw a complicated bill, such as any important railroad bill always is. You start out with an idea in your mind and you form your language to cover that point thoroughly; when you have finished you read it over again and think of it from a different angle and you find that while you have accomplished the thing that you wished to accomplish you have also done a dozen things that you did not wish to do. So you have to begin all over again.

The marvelous development and expansion of this country have been almost entirely due to our transportation facilities. In the early days the railroads were built entirely for opening up and developing the country and thereby increasing business to produce the revenue necessary to make the railroad a financial success. In some cases the dreams of the promoters were realized, and in other cases ambitious schemes were flat failures, so far as the financial success of the undertaking was concerned. There was no supervision exercised by any governmental function as to what eventually would be in the public interest and as a result we find the country covered with a network, forming by all odds the best railroad system in the world, but a system composed of strong lines, weak lines, long lines, and short lines. In my opinion the only solution of the question is the adoption of a scheme of consolidation or unification, whereby the railroads of the country can be combined into a very limited number of strong, efficient transportation systems, systems so constituted that there will be competition between the various systems as to service; I do not say competition in rates, because the rates are a matter of regulation. In saying this, I want you to understand thoroughly that I am speaking entirely in my individual capacity and do not at all assume to represent the sentiment of the committee of which I am chairman, or the sentiment of the Congress of the United States.

Consolidations Will Save Many Unsuccessful Roads

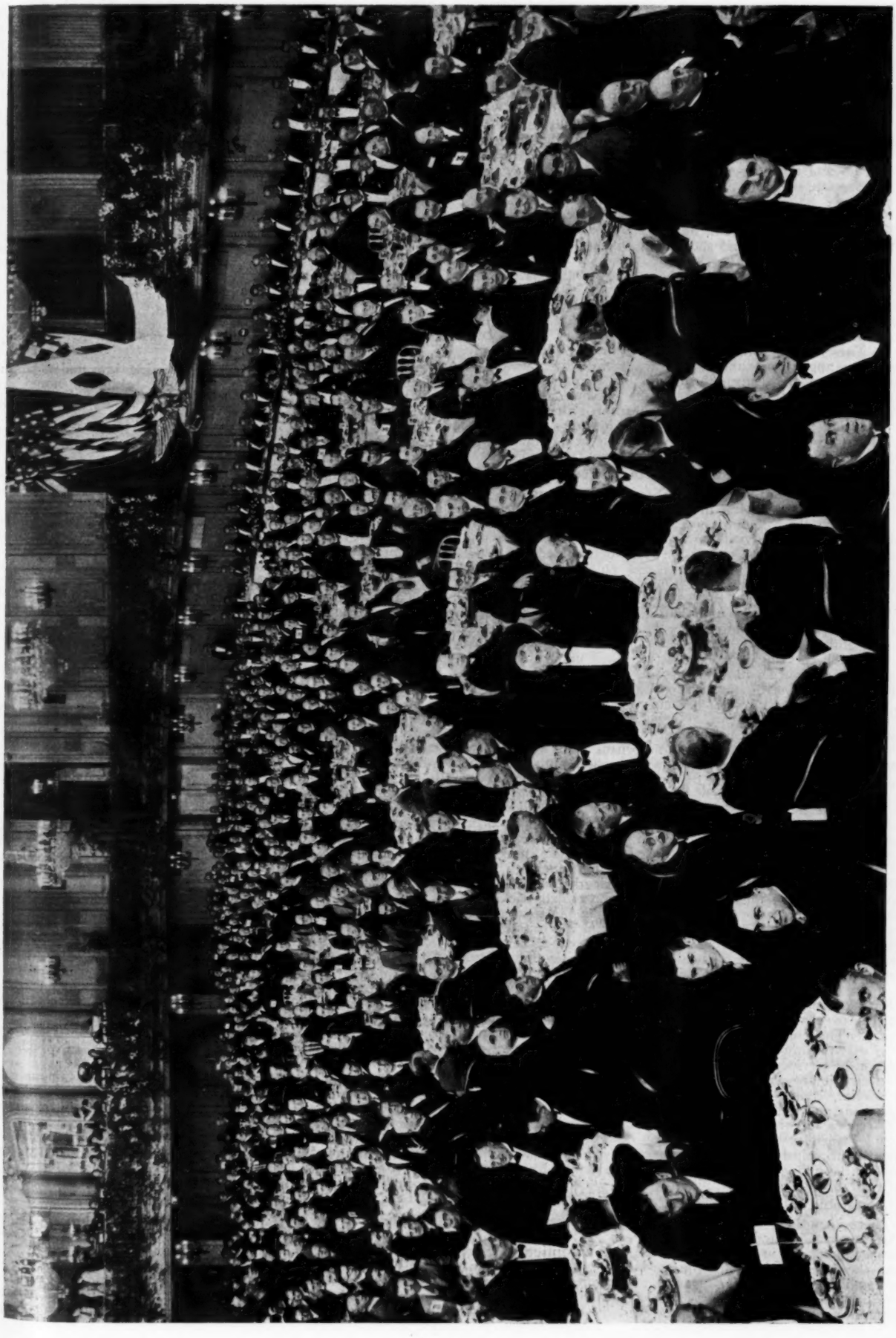
Upon many of these railroads there have grown up prosperous communities whose welfare and absolute existence are dependent upon the transportation facilities offered by some railroad, which, in its entirety, is financially unsuccessful. It is inconceivable to me that these roads can ever be abandoned and these communities deprived of their means of transportation, which, of course, would mean the destruction of the property of the community, for the property would be worthless without transportation facilities.

A certain element among the railroad management is apt to be severely critical of the Interstate Commerce Commission. I hold no brief for the Interstate Commerce Commission; its members are human and have made mistakes in the past as they will make mistakes in the future, but if their decisions are honest and their mistakes are honest it ill becomes the managements of the railroads of this country to find much fault. Allow me to venture a personal opinion; the one thing that stands between private ownership of transportation and Government ownership is the Interstate Commerce Commission. Business—and when I say business, of course, I mean to include the business of transportation—is controlled in three ways: By unlimited and unrestrained competition; by regulation, or by socialism.

We have abandoned unlimited competition as far as public utilities are concerned; therefore there is an obligation on the part of the Government to protect the public utilities from undue, unnecessary and ruinous competition. The private business of the country is controlled entirely by unlimited competition and the various anti-trust laws have been passed with the idea of preserving this competition. We recognized in the Transportation Act the fact that the railroads must be protected from ruinous competition, so we adopted the principle of a certificate of public convenience and necessity before a railway could be built or expanded, which is a definite recognition of the fact that the railroads must be protected from useless and ruinous competition. That, in turn, imposes upon the railways the obligation to charge rates that are just and reasonable.

Recapture as a Factor

Under the valuation act, which was passed to determine whether or not the railroads of the country were over-capitalized, it has been clearly determined by the Interstate Commerce Commission that they are not over-capitalized at all. It will



The A. R. E. A. Dinner Group in the Grand Ball Room of the Palmer House

be many years, in my judgment, before the actual value of the railroads will be determined, even relatively, for when the valuation under the Transportation Act means valuation for the recapture of excess earnings as well as the fixing of rates, it is quite a different matter from the tentative value for rate making purposes. Personally, I was never particularly impressed with the wisdom of the recapture clause and was of the opinion that it would not work.

This all brings us back to consolidation. I believe that the only way to avoid recapture is to so combine the railroads of the country that the weak lines of the country will be divided up and taken over by the strong lines. The railways, of course, can say that this is a recognition of the principle of recapture and I shall have to admit they are right. I also believe that when the strong roads get control of the weak roads, with their credit and efficient management, many of these so-called weak and short lines will be found profitable in the general scheme.

The policy of authorizing the unification of rail carriers and their properties, if such unification is in the public interest, has long been established. The provisions of existing law, however, under which it was contemplated that this policy should be carried out have proved impossible of administration. These laws, which were contemplated to be of only temporary application, and which are admittedly inadequate, have been and are being resorted to, but the time has come when the temporary provisions of the present law must be repealed and permanent provisions substituted therefor which are adequate to protect and promote the interests of the public, which are reasonably certain and possible of administration, and under which the established policy can be carried out.

Proposed Bill Remedies Defects of Present Laws

Briefly, the primary purpose of my bill is to remedy the defects of the existing law in order that the established policy of permitting the voluntary unification of railroads and their properties may be carried out, but only if, in each case, the Interstate Commerce Commission has determined that the proposed unification will promote the public interest. The bill has two main features: It affords greater and more effective protection to the public by prescribing the standards to be considered by the commission and by providing that only unifications which will effectively promote the public interest may be authorized; and it affords to the carriers more flexible methods for carrying into effect a proposed unification which has been approved by the commission.

Private operation of our transportation agencies under public regulation should be the permanent policy of our Government. Our present system of regulation, however, must be made more effective if private operation is to meet the just demands of the public. During the years 1923 to 1927, inclusive, the Interstate Commerce Commission authorized the abandonment of 3,052 miles of railroad engaged in interstate commerce. The abandonment of lines necessary to our transportation system should not be permitted; furthermore, the problems of weak lines cannot be solved by authorizing abandonments, but weak roads cannot long remain in existence, nor can they render the service to which their users are entitled, unless effective means are found by which their operation can be continued and their service improved. The carriers must place themselves in a position which will invite the capital necessary to improve and promote the service they are rendering. Many weak roads have found it absolutely impossible to obtain the money necessary for capital expenditures, while even some so-called strong roads have been compelled to rely upon bond issues when a sound financial program demands the issuance of shares of capital stock.

Rates must be soundly made and adjusted. Carriers are entitled to charge rates which will yield them a reasonable return. The public, on the other hand, is entitled to the best service at the lowest rates compatible with that service. Competition in service however, will undoubtedly bring about many necessary improvements, but competition, whether in rates or in service, cannot be effective unless the competing carriers are strong and well balanced. It is not asserted that unifications will remove all the difficulties of today, but unifications upon sound principles will prove a very substantial step forward toward the solution of our present problems and undoubtedly present the only effective method by which many of our present railroad difficulties can be relieved.

Systems of Today Were Formed by Unification

There is nothing new in this policy since practically all our great systems of today are the products of unifications. In the beginning the impelling motive was the extension of roads into the large trade centers in order to increase the ability to handle the expanding traffic, to permit the continuous handling of traffic, and to avoid delays and expense in frequent transfers. Subsequently, however, the movement became actuated by a desire to combine competing systems and the stranglehold of monopoly was substituted as the goal to be gained. The public and the Congress were quick to recognize the change in the ends to be accomplished, and the Sherman Act and the Clayton Act properly restrained further unifications of this nature. In addition, unifications of parallel and competing lines were commonly prohibited by State laws and constitutions.

If the public interest will be promoted by a proposed unification, everything should be done to encourage the prompt carrying into effect of the unification plan. If, on the other hand, it does not promote the public interest, the unification should be specifically prohibited and no opportunity should be afforded the carriers for attempting a unification.

Outline of Proposed Bill

Briefly, my proposed bill accomplishes the following:

(1) It authorizes railroad unifications which will promote the public interest and lays down very definite and specific standards to be considered by the Interstate Commerce Commission in determining whether or not a proposed unification will in fact promote the public interest.

(2) It removes the defects of the present law which have combined to prevent the promotion of the policy of voluntary unifications.

(3) It repeals the provisions of existing law under which so-called mergers have been attempted (although none has actually been authorized) and which have been subjected to considerable criticism.

(4) It grants to carriers all the power necessary to carry into effect a unification which will promote the public interest and which has been approved by the Interstate Commerce Commission, and removes existing barriers of Federal and State laws which otherwise would prevent the carrying into effect of the congressional policy.

(5) It affords adequate protection to dissenting stockholders who are not in accord with the will of the majority, and who wish to withdraw from the enterprise.

(6) It relieves the commission of the tremendous and probably impossible task imposed upon it of preparing a complete and comprehensive plan for the unification into a limited number of systems of all the railway properties within the continental United States.

(7) It prohibits all unifications except those proposed and carried out in accordance with the act, including consolidations, mergers, acquisitions of properties, and acquisitions of voting securities.

To be serious, we will never get an adequate system of unification until the various strong lines are willing to sit down and deal with one another across the table with the cards face up to do what is in the best interests of the public and not solely what is in the interest of the individual lines, for I believe that in the long run the public interest is identical with the railroads' interest.

Railways in International Affairs

By Hon. Vincent Massey
Canadian Minister to the United States

THIS IS, I believe, your thirtieth annual meeting, a significant milestone in the history of a great organization. It happens, that this year too, marks the centenary of a great achievement in the history of the railways of the world. In October, 1829, as many of you know, a very significant event took place at Rainhill in England which commenced a century of splendid development. The close of that century is marked by the accomplishment represented by you gentlemen here today and your colleagues in other countries. The event, you will recall, was a contest with four entries, of which the name of only one survives, "The Rocket."

When George Stephenson's "Rocket" won this famous contest, the directors of this adventurous railway made a most significant decision. They came to the conclusion that their passenger trains, as well as freight, had perhaps better be drawn by locomotives and not by horses, and so after years of experimentation and disappointment, the steam railway, just about a hundred years ago definitely began its career of progress. The iron horse began to feel his oats.

The Old Competitor

Then came the objection of the canals and toll roads. In all the century of its history, the railway has never lacked an adequate supply of opponents. Strangely enough it is now faced again with its old competitor, the highway, through its new ally, the motor car. Perhaps the aeroplane soon will add its quota of problems to railway transportation. Someone prophecied just the other day that all your first class passen-

gers were soon going to travel by air. I may tell you that in northern Canada we have already used heavy aeroplanes for the transportation of both workmen and building materials. But this, after all, was for use in railway construction, so that the aeroplane is still, as far as this incident is concerned, less a rival than a hand-maiden.

There is, I suppose, no better test of human imagination than a great invention like the modern railway. The people in the early years who saw nothing but failure in the path of its development were probably in the majority. But there were others who made embarrassing prophecies. When we look at modern time-tables we seem to have fallen very short of some of the generous forecasts of our ancestors, who prophesied that railway trains would run, before long, at 100 miles an hour. But we shall be content if the railways stand as one department of life where speed is sacrificed for safety.

The steady growth of efficiency and comfort over the 100 years represents a great panorama of effort. In 1927 I had the pleasure of attending that great pageant in Baltimore, the "Fair of the Iron Horse." I believe it was one of the most impressive events of the kind ever held. The whole continent was indebted to Mr. Willard and his colleagues for an achievement in which pictorial imagination and splendid organization were wonderfully combined.

Canada's Railway Building

In Canada we started railway building rather later than you and our first railway was not a very bold project. It ran south of Montreal, moving in a friendly sort of way towards your growing railway system in New York State. But it represented the beginnings of a healthy plant, for the 14 miles which were laid in 1836 grew in less than a century to the 40,000 miles of line which we possess today.

I fancy that there is no part of the world where railways mean more than they do to us here in North America. Civilization on this continent can almost be said to be woven into the network of lines, which give this continent a warp and woof of steel. The railway, let us never forget in this age of new inventions, was the instrument which gave our material well-being a reality. Perhaps that is why it has still a peculiar romance for us.

The building of the railways, the great task of developing and managing these vast corporations, are in themselves a superb work of imagination. A railway, after all, is a poem in practical form. I am not, at the moment, let me say, thinking of the imagination which enters into the nomenclature of Pullman cars—although I should love to meet the man who names them. What I meant to say is that we often fall into the mistake of thinking that the poet is simply a man of words. He can be a man of action as well. There is something of the poet in every great administrator, every great engineer, every great leader of finance and commerce.

The Railways and Political Unity

You, of course, can thank the railway for your physical unity. Your 48 states have been knit into one whole by the 240,000 miles of steel line which you possess. In Canada we owe perhaps an even greater debt to the railway builder. Our communities have been more scattered than yours, the area which they serve is larger and we have stood in greater need of the unifying force which railways can provide. A distinguished Canadian has said that "the railway found Canada scarcely a geographic expression and made it a nation." It is no wonder therefore that we have built railways until we find ourselves the second nation in the world as far as length of line is concerned and in mileage in proportion to our population, first, for we now have a mile of line for every 230 people. Our railway building, as it has happened, has taken place in a relatively short time. About 50 years ago we possessed only some 2,000 miles of steel, most of it concentrated in the central provinces.

Then came the building. When we Canadians need any encouragement for the future, one of the achievements in the past to which we can look back with reasonable pride is the story of how a scattered and none too rich population of some four millions flung a line of three thousand miles in length over the vacant prairies and through the mountain wilderness to make a union with a community of a few thousand souls on the Pacific coast.

Just before the Great War as you know, came the construction of two more Canadian trans-continental lines. Canada had already captured the great west but it was necessary to consolidate the position. And then in recent years, as everyone is aware, came the period of reorganization which has left us with two great systems, both servants of the public, but one owned by it.

The New Period of Building

After the war during a momentary period of economic depression we thought we had accomplished all the railway building we would require for a long time to come. In fact we fancied that we had anticipated the needs of the future by many years. In view of observations to this effect which were made within the last six or eight years, it is interesting to know that when the present program is completed we shall have actually built since the war over 4,000 miles of additional lines.

Of all of this new development, the most striking is the 500 miles from The Pas in Manitoba to the venerable harbor of Churchill on Hudson bay. Churchill was founded by the old Hudson's Bay Company in the 17th century. Engineers are at present restoring it to use, laying ties and rails on the snow, to be ballasted later, and are now within 15 miles of tidewater. Mineral wealth has been discovered within the area served which will probably itself justify the construction of the line. But apart from that the new route, with water transportation through the Hudson Straits will bring the cities of Edmonton and Saskatoon over one thousand miles closer to Liverpool than by the Great Lakes route and with a shorter haul by rail. Our railways and our mines have always been closely related. Lines which seemed to be built from overconfidence, have justified themselves by the minerals which they have tapped.

What They Mean to Canada

Railways are the very bones of the economic structure of Canada. They have made the unity of our nation a possibility. But they can hardly be said to belong only to the material sphere. Sixty years ago when the word "nation" came first to be used by the Canadian people, the project of a great railway was the concrete expression of a hope in the future, just as now the planning of new lines gives fresh reality to our confidence in our future. Of Canada it can be said that the railway is the evidence of our faith in ourselves. National consciousness in our country, as in yours, would have been unattainable without the physical communication and the human relationships which are made possible by modern transportation.

I have said nothing of the railway and its bearing on national life. What can we say about its relation to the international sphere? What is the bearing of organized transportation on the pressing question of international unity and the contact between nations? We should know something of that in North America. The railway is one great factor which helps to develop the traditional and perpetual friendship between your country and mine. There are about 45 lines which cross our border. We own and operate many miles of railway on your side and you reciprocate by the control of many miles on ours. Across the boundary a greater volume of passengers and freight flows than over any frontier in the world. And the questions which this skein of railways and boundary lines produce are settled as they arise according to the principles of neighborly common sense. Frontiers elsewhere seem often to resent the passage of a railway train. Those of you who have traveled in Europe since the war reasserted the aggressiveness of borders, will have often witnessed the contest between a line of steel and a psychological barrier where one crosses the border.

Influence On International Relations

What, I wonder, are the future international developments of railways? Has this venerable institution spent itself as far as world venture is concerned? I think not. Even as we meet here men are discussing afresh the new possibilities of that tunnel beneath the 20 miles of sea which runs between Great Britain and the Continent. The straits of Gibraltar may one day be tunneled.

Perhaps these suggestions may sound visionary but let me confess that the extension of transportation by land makes an unconquerable appeal to those of us to whom the charms of oceanic travel are more a matter of theory than of fact.

We are living in an age of transportation. Never has movement from place to place been so easy as now. Nor have human beings ever shown such a passion for movement. Contrast this era of easy transportation when millions travel daily and mileage is defied, with the stationary world of four centuries ago. We talk of this being an age of science—the mechanical age. So it is, but the most striking characteristic is that it is an age of movement. Mankind has become fluid.

What is to be the consequence of this increasing fluidity of human beings? When men and women move from continent to continent as if on a local journey what will be the result? It is not unreasonable—it is even obvious—to suppose that if *national* unity is aided by transportation the same great facilities for intercourse will help to achieve *international* concord. But this is not the whole story. Mr. Chesterton commences one of his books with the startling observation, "I have never managed to lose my old conviction that travel narrows the mind." He explains what he means when he says that "Many modern internationalists talk as if men of different nationalities had only to meet and mix and understand each other." Harmony between nations can, of course, never rest on physical contact alone. An open mind must go with it.

A. R. E. A. Announces New Officers

Report of ballot reported at yesterday's session—
Yager elected president

IMMEDIATELY prior to the adjournment of yesterday afternoon's session, the report of the tellers appointed to count the ballots for officers was announced. The officers elected were as follows:

President, Louis Yager, assistant chief engineer, Northern Pacific.

Second vice-president, L. W. Baldwin, president, Missouri Pacific System.

Secretary, E. H. Fritch (re-elected).

Treasurer, F. J. Stimson, assistant chief engineer maintenance, Western Region, Pennsylvania (re-elected).

Directors: J. E. Armstrong, assistant chief engineer, Canadian Pacific; C. C. Cook, maintenance engineer, Baltimore & Ohio; Frank Ringer, chief engineer, Missouri-Kansas-Texas.

Nominating Committee: C. W. Baldridge, assistant engineer, Atchison, Topeka & Santa Fe; A. N. Reece, chief engineer, Kansas City Southern; H. C. Crowell, assistant to chief engineer, Pennsylvania; W. T. Dorrance, designing engineer, New York, New Haven & Hartford; C. H. Tillett, signal engineer, Canadian National, Central Region.

In addition, G. D. Brooke, general manager, Chesapeake & Ohio, who was elected second vice-president a year ago, automatically becomes first vice-president.

Louis Yager
President

G. D. Brooke
First Vice-President

L. W. Baldwin
Second Vice-President

Louis Yager, President

The American Railway Engineering Association has chosen its presidents from among railway engineers who have achieved positions of rank as railway officers, and, taken together, these 25 men represent a composite of railway engineering talent. Considered individually, however, some of them have leaned to the administrative and others to the technical or scientific, while still others have embodied a balanced combination of the essential attributes for success in their chosen profession. Louis Yager, the latest addition to the roll of presidents, has manifested essential qualities of leadership and his railway background was one offering particular opportunity for development along administrative lines. Nevertheless, it is necessary to classify him among those engineers who are given to exceptionally thorough investigation of any subject assigned to them because of a sheer love of study.

In such men this attribute not only finds outlet in their work, but becomes manifest also during hours of recreation. Mr. Yager is a typical example of this type of mind, being given to rather wide reading on scientific, political and general subjects. However, he evidences much more of a desire for human contact than is usually found in the exceptional student. He has taken full advantage of the opportunities afforded by membership in the association to acquire a wide circle of friends among railway engineers, and overlooks no opportunity to discuss subjects of mutual interest with them.

Because of his penchant for exhaustive study, Mr. Yager is not satisfied until he is master of any problem with which he is confronted and, in a measure, it has made him somewhat of an idealist. He dislikes half-way measures or expedients or anything that savors of the palliative, although this can not be said to have warped his judgment or caused him to stray into the fields of the theorist. That he is thoroughly practical is evident by the extent to which his counsel is solicited by others. Thus, some years ago, he was selected to serve on a committee to which was assigned the task of studying the relative effect of freight and passenger traffic on maintenance of way expenses and is the author of the so-called "Yager formula."

Born at Germanstown, Wis., in July, 1877, he attended the University of Minnesota, from which he graduated in 1900. Immediately thereafter he entered the employ of the Northern Pacific, the railway property which he now represents as president of the as-

sociation. Indeed, he has been in the continuous service of that railway except for the period from July, 1929, to April, 1920, during which he was loaned to the United States Railroad Administration to serve as chief maintenance of way engineer, under Charles A. Morse, director of engineering.

Beginning railway service as a rodman and inspector on bridge work, he was engaged in bridge construction until 1902, when he was appointed supervisor of bridges and buildings, a position which he held for five years. Then, after five more years of railway construction, he was appointed division engineer at St. Paul, Minn., after which his duties were confined primarily to maintenance of way. In due course he was advanced to engineer maintenance of way of the lines east of Paradise, Mont. He continued in that position, save for the period of his federal service, until 1923 when he was promoted to assistant chief engineer, the position which he now holds. In general, therefore, his training has embraced a thorough balance of both construction and maintenance work which should prove of value to him as executive head of the A. R. E. A.

The new president has been a member of the association for more than half of its history, having joined on January 18, 1911. During all of this time he has been an exceedingly active member, having served for six years as a member of the Committee on Rail, seven years on the Committee on Economics of Railway Operation and eight years with the Committee on Ties. Unlike most members of the association who have received recognition by election to office or to membership of the Board of Directors, he has never served as a committee chairman.

To sum up those attributes which will serve him in good stead as the executive head of the association, he has a broad interest in railway engineering subjects and is an accepted authority in many; he possesses the elements of character necessary to successful leadership, he has a wide acquaintance, is a fluent and ready speaker and has shown that the welfare of the association lies close to his heart.

A. R. E. A. Registration

A TOTAL of 240 members and 118 guests registered yesterday, bringing the total registration for the first two days of the convention to 950 members and 355 guests, a combined total of 1305. This compares with the registration of 916 members and 311 guests or a combined total of 1,227 for the first two days last year and 892 members and 321 guests, or a combined total of 1,213 in 1927. The names of those who registered yesterday follow:

Members

A

Abbott, A. T., div. super., C. R. I. & P., Des Moines, Ia.
Adams, C. E., div. engr., Penna., Philadelphia, Pa.
Adams, Lem, road. asst., pres. staff, U. P., Omaha, Nebr.
Allen, E. Y., val. engr., Reading, Philadelphia, Pa.
Anderson, Irving, div. engr., A. T. & S. F., Kansas City, Mo.
Anderson, J. P., div. engr., N. C. & St. L., Atlanta, Ga.
Armistead, F. W., roadm., I. C., Mattoon, Ill.
Armstrong, J. O., div. engr., St. L.-S. F., Ft. Scott, Kans.
Arn, W. G., asst. chf. engr., I. C., Chicago.
Arthur, G. F., asst. engr., I. C., Chicago.

B

Bagley, F. H., sig. engr., S. A. L., Savannah, Ga.
Baker, W. E., superv. of fire prev., L. & N., Louisville, Ky.
Baluss, F. C., engr. brdgs. & bldgs., D. M. & N., Duluth, Minn.
Baldwin, Hadley, chf. engr., C. C. C. & St. L., Cincinnati, O.
Barnhart, E. H., ind. engr., B. & O., Baltimore, Md.
Barrett, W. C., trainm., L. V., Sayre, Pa.
Barry, G. R., asst. to engr. main. of way, Penna., Indianapolis, Ind.
Batchellor, F. D., div. engr., B. & O., Garrett, Ind.
Beckett, F. T., engr. maint. of way, C. R. I. & P., El Reno, Okla.
Begley, J. G., asst. div. engr., B. & O., Washington, Ind.
Bell, G. J., dist. engr., A. T. & S. F., Topeka, Kans.
Bevan, W. H. B., asst. dist. engr., Can. Nat., Toronto, Ont., Can.
Bishop, F. J., engr. sigs., bridges & blgs., T. T., Toledo, O.
Bowie, R. G., asst. engr., C. & W. I., Chicago.
Brown, N. C. L., engineer, General Railway Signal Co., Rochester, N. Y.
Burgess, T. A., asst. engr., M. P., St. Louis, Mo.
Burt, C. S., super. ties & treatment, I. C., Memphis, Tenn.
Burt, J. W., div. engr., C. C. C. & St. L., Indianapolis, Ind.
Byers, M. L., New York City.

C

Carroll, G. A., div. engr., C. R. I. & P., Dalhart, Tex.
Caruthers, E. W., asst. engr., Penna., Philadelphia, Pa.
Causey, W. B., vice-pres., M. E. White Co., Chicago.
Charleson, C. W., asst. engr., C. B. & Q., Lincoln, Neb.
Clark, A. M., engr. of track, N. Y. C. & St. L., Cleveland, O.
Clevenger, T. R., asst. div. engr., C. C. C. & St. L., Indianapolis, Ind.
Connor, E. H., chief engr., Missouri Valley Bridge & Iron Co., Leavenworth, Kans.
Collinsworth, J. R., asst. engr., I. C., Chicago.
Cook, R. A., chf. engr., C. & A., Chicago.
Coons, P. D., asst. val. engr., C. B. & Q., Chicago.
Craig, T. W., instrumentman, M. P., Jefferson City, Mo.
Cramer, W. N., supvr., I. C., Freeport, Ill.
Cranbrook, J. H., asst. engr., Wabash, Webster Groves, Mo.
Cronin, J. F., supvr. maint., T. & W., Sylvania, O.
Crowe, S. N., div. engr., Wabash, Moberly, Mo.

D

Danes, J. E., div. engr., Wabash, Decatur, Ill.
Davis, M. B., supvr., I. C., Mattoon, Ill.
DeLamater, B. E., asst. div. engr., C. C. C. & St. L., Galion, O.
Dennis, Walt, supt., N. J. I. & I., South Bend, Ind.
Dodgson, F. L., con. engr., General Railway Signal Co., Rochester, N. Y.
Doolittle, F. B., superv. of struct., N. Y. C., New York City.
Dorley, A. F., prin. asst. engr., M. P., St. Louis, Mo.
Dorr, F. L., asst. engr., Wabash, St. Louis, Mo.
Dorr, R. E., instrumentman, M. P., Jefferson City, Mo.
Drum, W. F., asst. engr., M. P., St. Louis, Mo.
Duffy, C. M., asst. sig. engr., C. R. I. & P., Des Moines, Ia.
Dyer, A. F., asst. engr., I. C., Dubuque, Ia.

E

Elliott, W. H., sig. engr., N. Y. C., Albany, N. Y.
Elsworth, R. B., asst. sig. engr., N. Y. C., Albany, N. Y.
Emerson, J. B., Verona Tool Works, Waukegan, Ill.
Eubank, R. P., gen. real estate agent, C. & O., Richmond, Va.

F

Fair, J. M., div. engr., Penna., Buffalo, N. Y.
Fanning, J. E., dist. engr., I. C., New Orleans, La.
Filippi, Hugo, pres., William Grace Co., Chicago.
Fisher, A. L., div. engr., St. L.-S. F., Enid, Okla.
Freeman, B. B., instrumentman, M. P., Jefferson City, Mo.
Frick, O. H., supt. C. M. S. P. & P., Portage, Wis.
Fulks, E. B., vice-pres., American Creosoting Co., Louisville, Ky.

G

Gaines, R. H., engr. maint. of way, T. & P., Dallas, Tex.
Gaylord, C. H., office engr., C. R. I. & P., Des Moines, Ia.
Geddes, L. H., sales engr., Greenlee Brothers & Co., Rockford, Ill.
Goos, J. H., inspec. engr., G. N., St. Paul, Minn.
Graham, F. M., asst. engr. of stands., Penna., Altoona, Pa.
Grandy, A. L., asst. to pres. and genl. mgr., P. M., Detroit, Mich.
Greene, T. H., div. engr., C. & O., Richmond, Va.

H

Hadley, E. A., chf. engr., M. P., St. Louis, Mo.
Hagan, J. S., elect. engr., C. R. of N. J., Jersey City, N. J.

Hales, F. S., engr., N. Y. C. & St. L., Cleveland, O.
Hamilton, G. F., dist. engr., C. B. & Q., Alliance, Neb.
Hamilton, Paul, asst. chief engr., C. C. C. & St. L., Cincinnati, O.
Hamilton, W. H., super. of rdwy. and struc., Montour, Coraopolis, Pa.
Hanna, J. V., chief engr., K. C. T., Kansas City, Mo.
Harman, H. H., engr. bridges, B. & L. E., Greenville, Pa.
Harrison, M. J. J., genl. scale insp., Penna., Chicago.
Harting, O. F., asst. chf. engr., Term. Railroad Assn. of St. Louis, St. Louis, Mo.
Hartvig, C. E., asst. sig. engr., C. R. I. & P., El Reno, Okla.
Heimbuecher, O. G., instrumentman, M. P., Coffeyville, Kans.
Heimerdinger, W. E., div. engr., C. R. I. & P., Cedar Rapids, Ia.
Henry, Ray, chf. draftsman, K. C. S., Kansas City, Mo.
Herth, C. E., div. engr., B. & O., Chillicothe, O.
Hinsch, L. C., asst. engr., C. M. St. P. & P., Milwaukee, Wis.
Hodge, W. B., div. engr., C. C. C. & St. L., Indianapolis, Ind.
Hodgman, B. B., vice-pres. & chief engr., National Water Main Cleaning Co., New York City.
Holmes, M. V., div. engr., A. T. & S. F., Marceline, Mo.
Hood, J. M., genl. superin., A. C. & Y., Akron, O.
Hopton, J. M., instrumentman, M. P., St. Louis, Mo.
Howard, H. S., asst. engr., Wabash, Montpelier, O.
Howard, L. F., chief engr., Union Switch & Signal Co., Swissvale, Pa.
Howard, N. L., pres., C. G. W., Chicago.
Huffman, Karl, asst. engr., C. N., Toronto, Can.
Humphreys, E. A., res. engr., C. C. C. & St. L., Cincinnati, O.

J

Jacobs, J. C., asst. engr., I. C., Carbondale, Ill.
James, W. W., valua. engr., C. R. of N. J., New York City.
Jerome, F. J., div. engr., N. Y. C., Chicago.
Johnson, C. S., bridge engr., Wabash, St. Louis, Mo.
Johnson, G. M., brdg. & bldg. supvr., Wabash, Montpelier, O.
Johnston, C. A., div. engr., Wabash, Montpelier, O.
Jonah, F. G., chief engr., St. L.-S. F., St. Louis, Mo.
Jones, A. R., div. engr., N. Y. C., Albany, N. Y.
Jump, S. C., roadm., I. C., East St. Louis, Ill.

K

Kasch, A. E., asst. engr., M. P., St. Louis, Mo.
Kegler, W. C., engr. trk. & roadwy., C. C. C. & St. L., Cincinnati, O.
Kelly, D. L., sig. acct., N. Y. C. & St. L., Cleveland, O.
Kennedy, R. W., rdwy. engr., valua., Wabash, St. Louis, Mo.
Kettenring, W. R., auditor capital expenditures, C. & N. W., Chicago.
Kiley, J. J., office asst., B. & M., Boston, Mass.
King, Thomas, supt., G. T., Durand, Mich.

L

Lang, P. G., Jr., engr. bridges, B. & O., Baltimore, Md.
Layng, F. R., asst. chf. engr., B. & L. E., Greenville, Pa.
Longshore, R. L., gen. mgr., T. & W., Sylvania, O.
Lower, L. O., asst. engr., N. Y. C., Chicago.

M

MacCart, W. T., timb. treat. engr., N. Y. C., Rome, N. Y.
Manson, E. F., div. engr., C. R. I. & P., Trenton, Mo.
Mapes, S. L., engr. maint. of way, C. R. of N. J., Jersey City, N. J.
Marshall, R. S., vice-pres., C. & O., Richmond, Va.
McClurg, J. G., asst. engr., A. T. & S. F., Chicago.
McFetridge, W. S., prin. asst. engr., B. & L. E., Greenville, Pa.
McGehee, R. G., asst. div. engr., C. & O., Clifton Forge, Va.
Meek, R. W., sig. engr., S. P., Houston, Tex.
Metcalf, E. W., acct. engr., M.-K.-T., St. Louis, Mo.
Michael, F. R., asst. archt., Wabash, St. Louis, Mo.
Miesse, W. H., res. engr., C. C. C. & St. L., Cincinnati, O.
Miller, R. M., instrumentman, M. P., Wynne, Ark.
Mock, J. C., sig.-elec. engr., M. C., Detroit, Mich.
Modjeski, R., con. engr., New York City.
Moffitt, H. C., engr.-acct., M. P., St. Louis, Mo.
Monahan, W. F., gen. track insp., S. P., San Francisco, Cal.
Montfort, R., cons. engr., L. & N., Louisville, Ky.
Montgomery, C. R., office engr., M.-K.-T., St. Louis, Mo.
Morgan, A. L., chief engr., D. M. U., Des Moines, Ia.
Moriston, A. H., engr.-acct., M. P., St. Louis, Mo.
Morse, W. L., spec. asst. engr., N. Y. C., New York City.
Moss, L. W., asst. engr., C. C. C. & St. L., Mt. Carmel, Ill.
Mottier, C. H., engr. of design, I. C., Chicago.
Mullen, Joseph, president, Arkansas Preservative Co., St. Louis, Mo.
Myers, J. B., engr. roadway & track, B. & O., Baltimore, Md.

N

Nagle, John R., div. engr., M. P., Poplar Bluff, Mo.
Needham, R. J., mech. & elec. engr., C. N., Toronto, Ont., Can.
Norvell, Max, asst. engr., M. P., Nevada, Mo.

O

Ostrom, J. N., cores. brdg. engr., C. B. & Q., Chicago.

P

Parks, L. L., motor car supvr., C. R. I. & P., El Reno, Okla.
Parsons, O. V., asst. engr., N. & W., Roanoke, Va.
Passel, H. F., div. engr., B. & O., Indianapolis, Ind.
Pate, C. C., instrumentman, M. P., Falls City, Neb.
Payne, G. W., asst. engr., M. P., St. Louis, Mo.
Peabody, J. A., sig. engr., C. & N. W., Chicago.
Pender, W. D., engr. in charge of tie treating, Can. Pac., Winnipeg, Man., Can.
Penfield, W. H., engr. maint. of way, C. M. St. P. & P., Chicago.
Perkins, H. M., asst. engr., N. P., St. Paul, Minn.
Petersen, W. H., chief engr., C. R. I. & P., Chicago.
Pfleging, F. W., sig. engr., U. P., Omaha, Neb.
Porter, H. T., chf. engr., B. & L. E., Greenville, Pa.
Potarf, E. L., div. engr., C. B. & Q., Alliance, Neb.
Potter, N. E., asst. engr., Wabash, Decatur, Ill.
Priest, R. N., asst. engr., A. T. & S. F., Emporia, Kans.
Pringle, J. F., asst. gen. supt. trans., Can. Nat., Toronto, Ont., Can.
Purdy, J. W., bridge inspec., B. & O., Cincinnati, O.

R

Ramsey, F. R., dist. engr., N. Y. C. & St. L., Frankfort, Ind.
Rawlings, J. H., asst. engr., M. P., St. Louis, Mo.
Ray, A. L., asst. engr., G. T. W., Durand, Mich.
Redfield, J. A. S., asst. engr. of maint., C. & N. W., Chicago.
Reinsagen, H. B., prin. asst. engr., N. Y. C., Cleveland, O.
Riley, F. L., asst. engr. bldgs., B. & O., Baltimore, Md.
Roach, J. H., chief valua. engr., N. Y. C., New York City.
Robinson, G. E., asst. engr., C. C. C. & St. L., Cincinnati, O.
Rodman, G. A., genl. superv. brdgs. and bldgs., N. Y. N. H. & H., New Haven, Conn.
Rogan, J. E., roadmaster, I. C., New Orleans, La.
Roller, W. L., engr. maint. of way, H. V., Columbus, O.
Roof, W. R., bridge engr., C. G. W., Chicago.
Rose, L. S., gen. mgr., P. & E., Indianapolis, Ind.
Rozema, N., asst. engr., C. R. I. & P., Chicago.
Rudd, A. H., chf. sig. engr., Penna., Philadelphia, Pa.
Rys, C. F. W., asst. to pres. and metal. engr., Carnegie Steel Co., Pittsburgh, Pa.

S

Saunders, H. R., supt., C. R. I. & P., Chicago.
Schilling, J. H., div. engr., Penna., Grand Rapids, Mich.
Schmitt, A. P., instrumentman, M. P., Monroe, La.
Schryver, H. F., prin. asst. engr., N. Y. C., Columbus, O.
Scott, R. W., instrumentman, C. B. & Q., Chicago.
Scowden, gen. brdg. inspr., B. & O., Cincinnati, O.
Searls, H. C., valtn. engr., M. P., St. Louis, Mo.
Shaughnessy, W. J., engr.-acct., M. P., St. Louis, Mo.
Shaw, W. J., Jr., div. engr., M. C., St. Thomas, Ont., Can.
Sherman, S. M., Jr., asst. engr., I. C., Chicago.
Shouse, G. B., asst. div. engr., B. & O., Cincinnati, O.
Simpson, W. E., asst. engr., C. R. I. & P., Kansas City, Mo.
Slibeck, G. J., chf. engr., Pettibone, Mulliken Co., Chicago.
Smith, Huntington, office engr., N. Y. C. & St. L., Cleveland, O.
Smith, R. C., chf. engr., M. N. & S., Minneapolis, Minn.
Smith, S. M., asst. bridge engr., Wabash, St. Louis, Mo.
Spalding, Lawrence, val. engr., B. & L. E., Greenville, Pa.
Sparks, A. L., architect, M.-K.-T., St. Louis, Mo.
Spiegel, F. M., asst. engr., N. Y. C. & St. L., Cleveland, O.
Splitstone, C. H., supt. of construction, Erie, New York City.
Staley, G. C., asst. bridge engr., M.-K.-T., St. Louis, Mo.
Stanley, H. W., pres., T. C., Nashville, Tenn.
Stevens, T. S., sig. engr., A. T. & S. F., Topeka, Kans.
Stokley, R. B., asst. div. engr., C. C. C. & St. L., Mt. Carmel, Ill.
Strattman, C. R., asst. engr., M. C., Jackson, Mich.
Strong, J. B., pres., Ramapo-Ajax Corp., New York City.
Stuart, H. B., chief of valua., C. N., Toronto, Ont., Can.

T

Tanner, R. A., asst. engr., N. P., St. Paul, Minn.
Taylor, W. T., res. engr., C. C. C. & St. L., Cincinnati, O.
Teisher, C. M., asst. engr., N. Y. C. & St. L., Cleveland, O.
Tesh, Murray, asst. engr., Wabash, Montpelier, O.
Tracy, D. F., asst. engr., M. P., Hermann, Mo.
Turneaure, F. E., dean col. of eng., University of Wisconsin, Madison, Wis.
Turner, F. P., prin. asst. engr., N. & W., Roanoke, Va.
Tuthill, G. C., bridge engr., M. C., Detroit, Mich.
Tyrrell, H. E., engr. maint. of way, S. R. S., St. Louis, Mo.

V

Vitt, J. T., div. engr., Wabash, Peru, Ind.

W

Wachter, R. E., asst. engr., M. P., St. Louis, Mo.
Wagner, P. P., asst. engr., M. P., Wynne, Ark.
Walker, B. S., asst. engr., Wabash, St. Louis, Mo.
Wallace, D. A., Chicago.
Wamsley, Cale, sr. asst. engr., M. P., St. Louis, Mo.
Wamsley, D. C., instrumentman, M. P., St. Louis, Mo.
Watkins, R. C., vice-pres. and gen. mgr., S. P., New Orleans, La.
Webb, H. E., supt., C. & O., Huntington, W. Va.
Weymouth, A. P., asst. engr., Penna., Pittsburgh, Pa.
Whipple, C. A., dist. engr., H. V., Columbus, O.
White, Lowell, gen. supt. tel., A. C. L., Wilmington, N. C.
Wildeson, W. W., chief drftsmn., N. Y. C. & St. L., Cleveland, O.
Williams, K. G., res. engr., U. P., Memphis, Tenn.
Wilson, A. R., engr. of bridges and bldgs., Penna., Philadelphia, Pa.
Winship, L. C., elec. engr., B. & M., North Adams, Mass.
Winton, R. P., catenary engr., N. & W., Roanoke, W. Va.
Wolf, Louis, senior asst. engr., M. P., St. Louis, Mo.
Wonson, S. L., asst. chf. engr., M. P., St. Louis, Mo.
Wood, B. A., chf. engr., M. & O., St. Louis, Mo.
Worthington, E. D., asst. engr., M. P., St. Louis, Mo.
Wyant, Leroy, sig. engr., C. R. I. & P., Chicago.

Guests

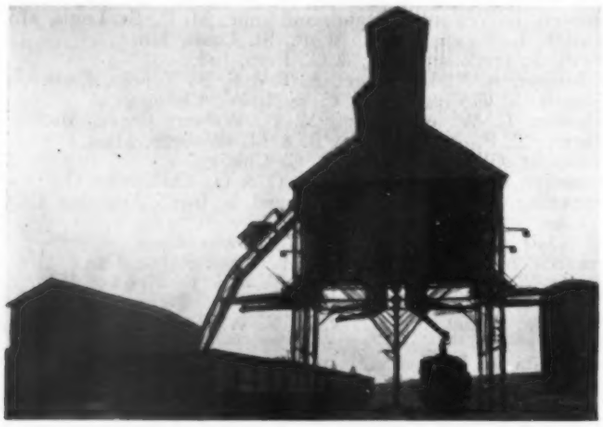
Ansden, R. B., asst. engr., signals, I. C., Chicago.
Albrecht, K. A., Harbor Commission, Milwaukee, Wis.
Anderson, H. W., div. engr., Penna., Akron, O.
Arndt, E. M., American Rolling Mill Co., Chicago.
Baker, S. C., eng. m. w., E. St. L. & S., E. St. Louis, Ill.
Bareuther, A. A., Robert W. Hunt Co., St. Louis, Mo.
Beegle, R. E., East St. Louis, Mo.
Bertel, B. J., asst. office engr. dept., M. P., St. Louis, Mo.
Besien, H. W., Union Switch & Signal Co., Swissvale, Pa.
Bishop, E. N., inspr. water serv., C. & O., Huntington, W. Va.
Blanchard, W. H., div. engr., C. M. St. P. & P., Green Bay, Wis.
Brand, E. L., div. engr., St. L.-S. F., Choffee, Mo.
Brice, N. R., asst. engr., Wabash.
Brightwell, J. L., supr. track, C. & O., Huntington, W. Va.
Broshears, Jas., supvr. track, C. & O., Chillicothe, O.
Butcher, C. E., supvr. track, C. & O., Eskdale, W. Va.
Carle, D. B., office engr., A. T. & S. F., Marceline, Mo.
Cartsoff, O. J. C.
Catherman, J. D., engr. m. w., Ill. Terminal, Springfield, Ill.
Chapin, P. E., asst. cost engr., C. & O., Peru, Ind.
Christeson, rodman, C. M. St. P. & P., Portage, Wis.
Church, F. G., supvr., Penna., Wooster, O.
Codington, W. L., div. engr., C. P., Medicine Hat, Alta., Can.
Collins, J. F., rd. mast., Soo, Waukesha, Wis.
Conley, M. L., track supvr., I. C., Freeport, Ill.
Connor, M. F., R. F. Rothschild & Co., New York City.
Crance, L. E., C. & O., Clifton Forge, Va.
Cummins, C. P., asst. engr., M.-K.-T., St. Louis, Mo.
Dailey, J. L., Pittsburgh-Des Moines Steel Co., Des Moines, Ia.
Dangremond, L. M., Chicago.
DeArmond, F. V., asst. engr., A. T. & S. F., Topeka, Kans.
Dennis, H. G., instrumentman, C. R. I. & P., Fairbury, Neb.
Derfus, F. A., Pittsburgh Plate Glass Co., Milwaukee, Wis.
Derrick, J. J., foreman, Penna., Dravosburg, Pa.
Dix, W. L., contracting engr., Mt. Vernon Bridge Co., Kansas City, Mo.
Dowdall, E. J., Universal Cement, Chicago.
Dunham, C. E., secy. to chf. engr., St. L.-S. F., St. Louis, Mo.
Edwards, C. F., asst. cost engr., C. & O., Huntington, W. Va.
Engelhardt, H. L., ser. insp., California R. R. Commission, San Francisco, Cal.
Fandberg, O. C., supr., Wabash, Peru, Ind.
Farrell, K. A., Jensen Bowen & Farrell, Ann Arbor, Mich.
Foster, C. J., instrumentman, C. B. & Q., Galesburg, Ill.
Fraser, W. R., dist. mgr., Ingot Iron Railway Products Co., Philadelphia, Pa.
Gardner, C. J., rd. mast., C. R. I. & P., Liberal, Kans.
Geites, F. A., asst. supvr., b. & b., Huntington, W. Va.
Gibson, R. H., C. & O., Clifton Forge, Va.
Gilbert, Wm., C. & O., Richmond, Va.
Guess, C. W., asst. fore. water supply, N. C. & St. L., Kenesaw, Ga.
Hawkins, E. H., engr. acct., M. P., St. Louis, Mo.
Henderson, C. C., C. R. I. & P., Eldon, Mo.
Henriques, E. J., office engr., M. & O., St. Louis, Mo.
Hooper, J. W., b. & b. supvr., N. C. & St. L., Atlanta, Ga.
Hoyt, H. B., div. engr., B. R. & P., E. Salamanca, N. Y.
Hutchison, N. W., asst. cost engr., H. V., Columbus, O.
Jacobson, C. C., Inland Steel Co., East Chicago, Ill.
Jones, L. E., chf. engr., Y. & N., Pittsburgh, Pa.
Jones, T. F., rd. mast., St. L.-S. F., Enid, Okla.
Justice, D., M. P., Monroe, La.
Kaiser, F. A., Harbor engr., Board of Harbor Commissions, Milwaukee, Wis.
Kellenberger, K. E., Union Switch & Signal Co., Swissvale, Pa.
Kelly, J. B., Soo, gen. rd. mast., Minneapolis, Minn.
Kinney, M., C. R. I. & P., Chicago.
Kittredge, R. L., cost engr., H. V., Columbus, O.
Koehler, P. L., supr. track, C. & O., Rainelle, W. Va.
Kruell, G. J., Bd. of Harbor Comm., Milwaukee, Wis.
Kutner, S. D., asst. engr., N. Y. C., New York City.
Latz, J. W., asst. chf. clerk, M. P., St. Louis, Mo.
Laughton, H. H., asst. to vice-pres., Southern.
Leech, J. O., Carnegie Steel Co., Pittsburgh, Pa.
Lichty, C. A., insp., C. & N. W., Chicago.
Lundahl, R. R., Harbor Comm., Milwaukee, Wis.
Lyon, H. D., I. C., Washington, D. C.
Manby, H. R., chf. engr., T. C., Nashville, Tenn.
Marmet, E. C., asst. engr., B. & O., Chillicothe, O.
Mauer, R. W., draftsman, A. T. & S. F., Chicago.
McLeod, J. A., chf. engr., S. & A., Savannah, Ga.
Milnn, R., asst. cost engr., H. V., Toledo, O.
Miller, W. T., engr. m. w. Penna., Harrisburg, Pa.
Mills, S. N., asst. dir. Bureau of Safety, I. C., Washington, D. C.
Myer, M. L., office engr., St. L.-S. W., St. Louis, Mo.
Nichols, P. F., div. engr., Erie, Marion, O.
Notgrass, C. D., trainmaster, A. T. & S. F., Chaunte, Kans.
Pferl, C. M., Chicago.
Pollak, F. A., asst. engr., St. L.-S. F., St. Louis, Mo.
Popejoy, C. F., supvr. water serv., M. P., Falls City, Mo.
Postal Telegraph, Chicago.
Rittenhouse, steel brdg. insp., M.-K.-T., Springfield, Mo.
Reifenstuhl, A. J., instrumentman, C. M. St. P. & P., Portage, Wis.
Roberts, D. W., supvr. maint. and impr., M. P., St. Louis, Mo.
Russch, L. T., engr. acct., M. P., St. Louis, Mo.
Ryan, S., track supvr., C. & O., Peru, Ind.
Schroeter, A. X., asst. engr., A. T. & S. F., Topeka, Kans.
Schultz, E. E., asst. engr., C. & N. W., Chicago.
Shuman, C. W., engr. acct., M. P., Webster Grove, Mo.
Sherry, T. F., Jr., head clk., B. & M., Woburn, Mass.
Simmons, G. E., asst. engr., I. C., Chicago.
Snouffer, H. H., asst. cost engr., C. & O., Chillicothe, O.
Spradling, W. S., asst. gen. b. and b. fore., Arkansas City, Kan.
St. Clair, R. R., rd. mast., M. P., Downs, Kans.
Swartz, W. G., engr.-acct., C. N., Toronto, Ont., Can.
Sweet, Arthur, b. & b. fore., A. T. & S. F., Newton, Kan.
Tranzow, F. C., supvr. b. & b., G. T. W., Durand, Mich.
Tranzow, Frank, supt. track, G. T. W., Detroit, Mich.
Uzefovich, A. M., mil. engr.
Van Atta, R. E., asst. engr. to gen. mgr., K. C. S.
Vien, Thos., deputy ch. comm., Board of Ry. Commission of Canada, Ottawa, Ont., Can.
Ware, B. C., mas. carpenter, C. R. I. & P., Chicago.
Waugh, W. D., Detroit Graphite Co., St. Louis, Mo.
Weaver, J. E., supvr., B. & O., Washington C. H., O.
Weedon, R. E., supt. of rdwy. shops, Southern, Washington, D. C.
Wells, W. M., supvr., B. & O., Indianapolis, Ind.
Weschrifrt, H. J., div. engr., Erie, Meadville, Pa.
White, F. J., elec. engr., Okonite Co., New York City.
Woermann, J. W., U. S. Civil Engineer, Chicago.
Wollner, Duane, instrumentman, M. P., Wynne, Ark.
Wood, J. P., supvr. b. & b., P. M., Saginaw, Mich.
Wood, T. G., industrial and agricultural agt,. Roanoke, Va.
Zeeman, M. J., asst. engr., A. T. & S. F., Chicago.

A Locomotive Coaling Plant With Suspended Steel Bunkers

THE Roberts & Schaefer Company, Chicago, in co-operation with W. T. Krausch, engineer of buildings of the Chicago, Burlington & Quincy, recently designed and erected for that road a locomotive coaling plant in which two suspended steel bunkers, each with a capacity of 200 tons, were provided for delivering two kinds of coal to locomotives on four tracks. The plant serves the Burlington's Western avenue terminal at Chicago. Coaling plants of this size are usually built of reinforced concrete at a cost approximating that for steel construction, but the latter was adopted in this instance owing to the possibility of future changes in the terminal, involving the removal of the plant to another location.

Side View Showing Arrangement of Bunkers

Roberts & Schaefer equipment is used throughout in this plant, a Simplex automatic electric roller skip-hoist delivering coal by a two-ton bucket at the rate of 60 tons per hour and a movable gate at the dumping point deflecting the coal to the desired bin. The automatic hoist, which is direct-connected, is equipped with a Falk herringbone gear reduction between the motor and the countershaft to provide quiet operation. Four side-cut coaling gates in each bin make possible the delivery of coal without segregation of the lumps and fine materials to locomotives on each of the four tracks. The chutes for the gates on the outside tracks are operated by special ball-bearing chain hoists to insure their being held in position.



End View of Coaling Plant

Union Table Circuit Controller

A TABLE circuit controller suitable for use with remote-control systems has been developed and placed on the market by the Union Switch & Signal Company. This controller uses a minimum of two wires and has contact capacity for seven independent circuits. It does not require magnets or other locking devices, is of the unit type, is extremely compact and, when more than one unit is used, they can be mounted on a common base which can be installed easily on a table or shelf. New units, therefore, can be added with ease.

This new Union circuit controller is actuated by a handle of the same type as used on the Union car retarder control panel and the various positions are defined by the ball and notch method, a ball being forced into depressions in a segment at the rear end of the contact roller, thus holding the circuit controller in any one of its positions. Spring push buttons are placed in this machine for special control features. The track diagrams are in the form of detachable etched plates. Signals are designated by dots and the indication lights are the same as used on Union track models.

Union Table Circuit Controller for Remote Control

This unit is made up for two, three, or five-position operation—a feature which makes it particularly adaptable for remote-control operation. In the "two-wire and common" combination of circuits, one of the table circuit controller units is used for switch control and another for signal control. When used in this way, the switch control unit operates through two positions and the signal control unit through three positions. In the "one wire and common" scheme, one of these controllers, operating in five positions, is used for both switch and signal control, without, however, providing for the directional control of signals.

When this table circuit controller is used with the "two wire and common" method of remote control, the push button usually serves to annul the approach indication that is set up by a train entering the approach section and which persists until the operator acknowledges it by pushing the button. The simplicity of this machine, and its compactness, make it suitable for use where an easily installed circuit controller must be added to existing installations.